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SUMMARY OF THE 1985 NORTH PACIFIC ALBACORE FISHERY DATA

by

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ADMINISTRATIVE REPORT LJ-86-10

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SUMMARY OF THE 1985 U. S. NORTH PACIFIC ALBACORE FISHERY DATA

INTRODUCTION

The 1985 fishing season marks the 12th successive year that state and federal agencies have worked together to collect information on the U.S. North Pacific albacore fishery. Throughout the season, California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fisheries (WDF), Pacific Marine Fisheries Commission (PMFC), Western Fishboat Owners Association (WFOA) and the Honolulu Laboratory of the Southwest Fisheries Center (SWFC) distributed logbooks to fishermen and sampled the catch from fishing vessels as they returned to ports.

Early in April, before the start of the 1985 fishing season, more than 400 albacore logbooks were sent by mail to members of WFOA. An additional 500 logbooks were distributed at dock sites in California, Oregon, Washington and Hawaii by samplers to interested fishermen from June to September. Those fishermen, who participated voluntarily in this sampling project, recorded daily fishing effort, numbers of fish caught, types of gears used, and real-time environmental data in these logbooks during fishing activities. The completed logsheets were submitted by fishermen to samplers assigned to the dock sites during the fishing season. If the fishermen did not have access to logbooks, samplers conducted interviews for the necessary information when returning vessels unloaded their catches. These field biologists also measured and collected length-frequency samples of the unloaded catches from the sampled vessels.

In this report, we present data collected from the 1985 U.S. North Pacific albacore fishery. Areas covered include the traditional fishing grounds off the U.S. west coast from central Baja California to British Columbia, areas north of Hawaii, and areas in the western Pacific. Data are summarized and compared with those collected during the 1984 fishing season. Landings from foreign fisheries including Canada, Japan, and Taiwan from 1952 to 1985 are also included for comparison purposes.

SAMPLING COVERAGE

Sampling coverage for the U.S. North Pacific albacore fishery in 1984 and 1985 was measured as the ratio of sampled landings in weight to total landings in weight (Tables 1a-1b). During the 1985 U.S. North Pacific albacore fishing season, an estimated 17,484,820 lbs (7,931 mt) of albacore were landed in ports throughout California, Hawaii, Oregon, and Washington. Of this total, approximately 61% (10,608,068 lbs; 4,812 mt) was

sampled for catch and effort (information collected from voluntary logbooks and interviews), and 3% (458,534 lbs; 208 mt) was sampled for length-frequency. During the 1985 albacore fishing season, catch and effort coverage rates, as estimated from sampled landings in weight, increased from 53% in 1984 to 61% in 1985. Coverage rates for length-frequency samples increased from 1% in 1984 to 3% in 1985. Approximately 82% of the U.S. North Pacific albacore catch for 1985 was landed in California, 7% in Hawaii, 9% in Oregon, and 2% in Washington. Compared to 1984 landings, albacore landings in 1985 for Washington and Hawaii increased 130% and 47% respectively, and those for California and Oregon decreased 49% and 8%, respectively.

Table 1a. Sampling coverage for the U.S. North Pacific albacore fishery by state in 1985.

State	Total Landings (lbs)	Landings Sampled (lbs)	Percent Coverage	Number Vessels Sampled	Avg. Landings in Pounds Per Vessel
		Catch and Effort			
California	14,370,000	8,642,295	60%	500	17,285
Hawaii	1,236,000	817,196	66%	9	90,799
Oregon	1,522,183	869,365	57%	54	16,099
Washington	356,637	279,212	78%	28	9,971
Total	17,484,820	10,608,068	61%	591	17,949
		Length Frequency			
California	14,370,000	330,584	2%	331	-
Hawaii	1,236,000	4,524	<1%	6	-
Oregon	1,522,183	114,228	8%	38	-
Washington	356,637	9,198	3%	6	-
Total	17,484,820	458,534	3%	381	-

Table 1b. Sampling coverage for the U.S. North Pacific albacore fishery by state in 1984.

State	Total Landings (lbs)	Landings Sampled (lbs)	Percent Coverage	Number Vessels Sampled	Avg. Landings in Pounds Per Vessel
		Catch and Effort			
California	28,250,000	14,695,187	52%	587	24,989
Hawaii	840,000	753,263	90%	13	57,943
Oregon	1,650,466	970,448	59%	131	7,408
Washington	154,859	139,934	90%	31	5,354
Puerto Rico	154,000	-	-	-	-
(Other)	116,000	-	-	-	-
Total	31,165,325	16,558,832	53%	762	21,730
		Length Frequency			
California	28,250,000	266,323	1%	332	-
Hawaii	840,000	10,257	1%	15	-
Oregon	1,650,466	142,632	9%	79	-
Washington	154,859	4,624	3%	9	-
Puerto Rico	154,000	-	-	-	-
(Other)	116,000	-	-	-	-
Total	31,165,325	423,846	1%	435	-

CATCH

Total reported commercial landings for the 1985 U.S. North Pacific albacore fishery was 17,484,820 lbs (7,931 mt). This total catch represents a 44% decrease from the 31,165,325 lbs (14,136 mt) recorded for 1984 (Table 3, Figure 1). The fishery for 1984 and 1985 was arbitrarily divided into two areas: (1) the inshore area, from the U.S. coastline to 140° west longitude, and (2) the offshore area, west of 140° west longitude.

The U.S. North Pacific albacore surface fleet in 1985 fished extensively in areas west of 140° west longitude from early May to early August (Figures 2b-2e). During the 1984 season, the

offshore fishing was weak throughout May and June, but was fairly strong midway through the season until early September. As in 1984, early catches of albacore in April 1985 were reported by vessels in transit to the central and western North Pacific (Figure 2a). Throughout May and June 1985, these larger jigboats (>55-foot length; 16.8 meter) also reported excellent fishing in a 10° quadrangular area, 30° north latitude and 165° west longitude (300-400 nautical miles northeast of Midway Island).

Albacore fishing inshore started early in June 1985, and significant catches were recorded in the second half of the month in areas between 75 and 300 nautical miles off southern California (Figure 5e). The 1985 albacore fishing season, like the 1984 season, came to a close in inshore areas off central California late in October.

Although the distribution of catches inshore and offshore for both years was geographically similar, there were significant differences in the numbers of fish caught by areas for 1985 and 1984. There was a 42% decrease in catches in the inshore area and a 53% decrease in catches offshore for 1985, compared with catches in those same areas for 1984. In 1985, the inshore catch was 82% of the total landings, and offshore catch was 18%. In 1984, inshore catch was 83% of the total landings, and offshore catch was 17%. The area offshore and north of 40° north latitude, which was very productive in 1984, was less productive in 1985. The most productive fishing offshore in 1985 was reported from areas south of 40° north latitude early in the season throughout May and June (Figures 5b-5e). Excellent fishing midway through the season was found inshore in areas north of 40° north latitude (Figures 5h-5i).

EFFORT

Fishing effort (days fished) for the 1985 U.S. North Pacific albacore fishery was significantly lower than fishing effort in 1984. There was a decrease of 25% from the reported 10,321 days fished in 1984 to the 7,725 days fished in 1985. In 1985, 82% of the sampled effort (6,341 days fished) spent in the inshore area yielded 80% of the sampled catch (8,490,146 lbs); in 1984, 77% of the effort (7,956 days fished) spent in this same area yielded 76% (12,848,990 lbs). In 1985, 18% of the sampled effort (1,384 days fished) spent in the offshore area yielded 20% of the sampled catch (3,309,918 lbs); in 1984, 23% of the effort (2,365 days fished) spent in this same area yielded 24% (3,903,773 lbs). The 55-foot jigboats expended the most effort (days fished) in the fishery in 1985, and the 45-foot jigboats expended the most effort in 1984 (Figure 3).

CATCH-PER-UNIT OF EFFORT BY JIGBOATS

Estimated annual catch-per-unit effort (CPUE), in numbers of fish caught for one day of fishing for a standard 45-foot (14 meter) jigboat increased slightly from 81.0[1] fish per day in 1984 to 82.0 fish per day in 1985 (Figure 4). The highest CPUEs of 185-225 fish per day (calculated in half-month periods) for a standard size jigboat were reported from offshore areas in 1985 from May to mid-June (Table 2). These high CPUEs were reported from a 10° quadrangular area 30° north latitude and 165° west longitude (Figures 5b-5d). Fairly high CPUEs of 107-115 fish per day for a standard size jigboat were also reported from inshore areas in 1985 during the month of August (Table 2). These high CPUEs were reported from inshore areas 400-1000 nautical miles due west of Newport, and 50-300 nautical miles off Cape Mendocino and San Francisco. Catch rates of 55-66 fish per day for July 1985, although normal for that time of the season, were considerably smaller than the 105-126 fish per day recorded for the same period in 1984.

Table 2. Standardized fishing effort in days fished, catch in numbers of fish caught, and CPUEs (average number of fish per day) by half-month for 1984 and 1985.

Year		1985			1984		
Month	Time Period	Sampled Effort	Catch	CPUE	Sampled Effort	Catch	CPUE
April	1-15	1	0	0	0	0	0
	16-30	17	45	3	11	0	0
May	1-15	53	11,721	221	100	733	7
	16-31	86	19,380	225	163	14,520	89
June	1-15	147	27,269	185	253	38,086	150
	16-30	522	47,067	90	404	50,270	124

[1] Annual CPUE value for 1984 was recalculated to 81.0 when more data were added.

July	1-15	497	27,497	55	917	115,520	126
	16-31	735	48,275	66	891	93,635	105
August	1-15	930	100,156	107	1,492	147,796	99
	16-31	899	103,043	115	1,606	117,806	73
September	1-15	1,076	75,409	70	1,395	66,224	47
	16-30	578	21,550	37	918	52,612	57
October	1-15	394	14,948	38	481	16,019	33
	16-31	261	10,031	38	415	15,174	37

In 1985, the number of 1° squares with CPUEs greater than 200 fish per day was three more than in 1984. Unlike 1984 where most of the 1° squares with CPUEs greater than 200 were located north of 40° north latitude, most of the 1° squares with CPUEs greater than 200 in 1985 were located south of 40° north latitude. In both years, the majority of 1° squares with CPUEs over 200 were located offshore (Figures 5).

LENGTH FREQUENCY

During the 1985 albacore fishing season, 30,508 length measurements were taken of fish caught by the U.S. North Pacific albacore fleet. Of these samples, approximately 91% were taken from the inshore area, 3% offshore, and 6% unclassified. Approximately 11% of the measured fish were taken from baitboats, 81% from jigboats, 5% from vessels using a combination of jig and bait, 2% from gillnet vessels, and less than 1% each from longline and purse seine vessels (Figure 7). The average length of albacore measured in 1985 was 69.0 centimeters (cm) in fork length (tip of of the mandible to the fork of the tail). This was higher than the 66.1 cm average fork length recorded for 1984. Fish caught inshore in both years were mostly in the range of 60-66 and 74-82 cm in fork length (Figure 6). There were more fish in the 74-82 cm size range caught inshore and south of 40° north latitude in 1985 than in 1984. In both years, these larger fish were more vulnerable to baitboats and vessels using a combination of bait and jig in the inshore areas. Most of the albacore caught by the larger jigboats offshore in 1985 were in

the 60-66 cm range; the same size fish were also caught in these areas in 1984.

SEA-SURFACE TEMPERATURE

Sea-surface temperatures (SSTs) observed from commercial transport vessels, fishing boats and research vessels were compiled into monthly means and plotted on charts with 1° quadrangle resolution (Figure 8). Analyses of these charts provided useful information about the distribution of sea-surface isotherms and the location of surface ocean fronts.

In May 1985, active fishing began west of 160° near 35° north. The subtropical ocean front was stronger than normal in this region from April through June (Figure 8a-8c). In June, the offshore fishery shifted north of 35° north latitude and eastward as SSTs greater than 15° C (59° F) moved northward more rapidly than normal. The inshore fishery started early in June when SSTs were 16.0°-17.0° C (61.0° - 63.0° F), and a sharp ocean front was developing south of Point Conception. In the first half of July the offshore fishery continued to shift northeastward and was centered along 40° north latitude. In this region, the subtropical ocean front merged with the polar ocean front and was usually strong along 40° north, west of 150° west longtitude. The inshore fishery continued along a sharp frontal boundary which extended southeast from Point Conception.

During the second half of July, the offshore fishery continued to move northeastward into a region where SSTs were increasing at above normal rates. At the same time, the inshore fishery shifted northward and was located along the western peripheral of the coastal upwelling which stretched from Oregon to Point Conception. Along the coasts of California and Oregon, good upwelling began in June in response to persistent and strong northerly winds. This created many areas of strong temperature edges (fronts) where fishing was active after mid-July. In August, the offshore fishery had merged with the inshore fishery along 45° north latitude. The inshore fishery continued along the western edge of the coastal upwelling which remained strong through September (Figure 8f). During September, the greatest fishing activity occurred along the coast from Point Conception to Cape Blanco. In this region, coastal upwelling maintained good temperature edges, especially south of 40° north latitude. By October, SSTs were 1.0°-2.0° C (1.8°-3.6° F) below normal in areas north of 35° north latitude, and most of the coastal upwelling had decreased and centered in areas 40°-45° north latitude.

DISCUSSION

Although albacore fishing was less successful in 1985 than in 1984, excellent offshore catches were reported early in the season throughout May and June 1985 in areas 300-400 nautical

miles northeast of Midway Island. Fishing inshore started early in 1985 with significant catches off southern California throughout June. In contrast, the offshore fishing in 1984 was weak in May with significant catches reported in late June. In 1984, the amount of fish caught by the fleet in the inshore area was not significant until the second half of July. As in 1984, fish caught earlier in the season in 1985 were taken west of Erben Bank (33°N, 133°W) by the larger jigboats leaving for areas north of Hawaii and the western Pacific.

Favorable environmental conditions offshore from April to June 1985 may have contributed to the success of the larger jigboats fishing 300-400 nautical miles northeast of Midway Island early in the season (Figures 8a-8b). Strong coastal upwelling inshore in September may have contributed to the success of vessels fishing in areas from Point Conception to Cape Blanco late in the season (Figure 8f). The average size of albacore caught in 1985 was 69.0 cm in length (15.0 lbs), which was larger than the 1984 average size of 66.1 cm (13.1 lbs). Estimated annual CPUE for a standard vessel in 1985 was 82.0 fish per day, which was slightly higher than the 81.0 fish per day in 1984.

Highlights of the 1985 fishing seasons included: 1) the total number of fish caught in 1985 decreased by 44%; 2) the largest number of 1° squares with CPUEs greater than 200 were located offshore and south of 40° north latitude; 3) offshore fishing lasted until early August; 4) significant catches were made throughout June early in the season in inshore areas off southern California; 5) the best catches were made in May and June offshore; 6) the larger size fish of 74-82 cm in fork length were caught in increased numbers inshore and south of 40° north latitude; 7) well-defined frontal areas existed early in the season (April-June) in offshore areas and south of 40° north latitude; and 8) coastal upwelling was strong in inshore areas from Point Conception to Cape Blanco late in the season.

ACKNOWLEDGEMENTS

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Table 3. Catches for North Pacific albacore in metric tons, 1952-1985.

	Japan					Taiwan	United States				Canada	
Year	Bait boat	Long-line	Gill net	Other gear	Total	Long-line	Bait boat	Jig-boat	Sport	Total	Jig-boat	Grand Total
1952	41,386	26,687	-	237	68,310	-	-	23,843	1,373	25,216	71	93,597
1953	32,921	27,777	-	132	60,830	-	-	15,740	171	15,911	5	76,746
1954	28,069	20,958	-	38	49,065	-	-	12,246	147	12,393	-	61,458
1955	24,236	16,277	-	136	40,649	-	-	13,264	577	13,841	-	54,490
1956	42,810	14,341	-	57	57,208	-	-	18,751	482	19,233	17	76,458
1957	49,500	21,053	-	151	70,704	-	-	21,165	304	21469	8	92,181
1958	22,175	18,452	-	124	40,751	-	-	14,855	48	14,903	74	55,728
1959	14,252	15,502	-	67	29,821	-	-	20,990	0	20,990	212	51,023
1960	23,156	17,369	-	76	40,601	-	-	20,100	557	20,657	5	61,263
1961	18,636	15,764	-	268	34,668	-	2,837	12,061	1,355	16,253	4	50,925
1962	8,729	13,464	-	191	22,384	-	1,085	19,760	1,681	22,526	1	44,911
1963	26,420	15,458	-	218	42,096	-	2,432	25,147	1,161	28,740	5	70,841
1964	23,858	13,701	-	319	37,879	26	3,411	18,392	824	22,627	3	60,535
1965	41,491	25,050	-	121	56,662	16	417	16,545	731	17,693	15	74,386
1966	22,830	28,869	-	585	52,284	16	1,600	15,342	588	17,530	44	69,874
1967	30,481	23,961	-	520	54,962	17	4,113	17,826	707	22,646	161	77,786
1968	16,597	23,061	-	1,109	40,767	15	4,906	20,444	951	26,301	1,028	68,111
1969	32,107	18,006	-	1,480	51,593	21	2,996	18,839	358	22,193	1,365	75,172
1970	24,378	15,372	-	956	40,706	23	4,416	21,041	822	26,279	345	67,353
1971	53,198	11,035	-	1,262	65,495	24	2,071	20,537	1,175	23,783	1,587	90,889
1972	60,762	12,649	1	921	74,333	25	3,750	23,608	637	27,995	3,558	105,911
1973	69,811	16,059	39	1,883	87,792	35	2,236	15,667	84	17,987	1,270	107,084
1974	73,576	13,053	224	1,065	87,918	40	4,777	20,187	94	25,058	1,207	114,223
1975	51,157	10,060	166	402	61,785	28	3,243	18,975	640	22,858	101	84,772
1976	83,336	15,896	1,070	1,394	101,696	37	2,700	15,932	713	19,345	252	121,330
1977	31,934	15,737	688	1,039	49,398	61	1,497	10,005	537	12,039	53	61,551
1978	59,877	13,061	4,029	3,209	80,176	53	950	16,682	810	18,442	23	98,694
1979	44,662	14,249	2,856	1,280	63,047	81	303	6,801	74	7,178	289	70,595
1980	46,743	14,743	2,986	1,516	65,988	-	382	7,574	168	8,124	212	74,324
1981	27,426	18,020	17,425	956	63,827	-	748	12,694	195	13,637	98	77,562
1982	29,615	16,762	17,947	1,054	65,378	-	425	6,661	257	7,343	1	72,722
1983	21,098	15,103	9,160	471	45,832	-	607	9,512	87	10,206	64	56,102
1984	26,000	-	-	-	-	-	832	9,576	1,427	15,563[7]	18	-
1985	-	-	-	-	-	-	872	7,059	1,176	9,107	1	-

Remarks:

1. Figures for 1984-85 are preliminary.
2. Japanese longline catches for 1952-60 exclude minor amounts taken by vessels under 20 tons. Longline catches in weight are estimated by multiplying annual number of fish caught by average weight statistics.
3. Japanese baitboat catches include catches by research vessels.
4. U.S. Jigboat catches for years 1952-60 include baitboat catches.
5. United States sport catch is a minimum estimate based on partial coverage.
6. U.S. catches from 1961 to 1985 include Hawaii.
7. United States total for 1984 include catches (3,728 mt) by purse seines.

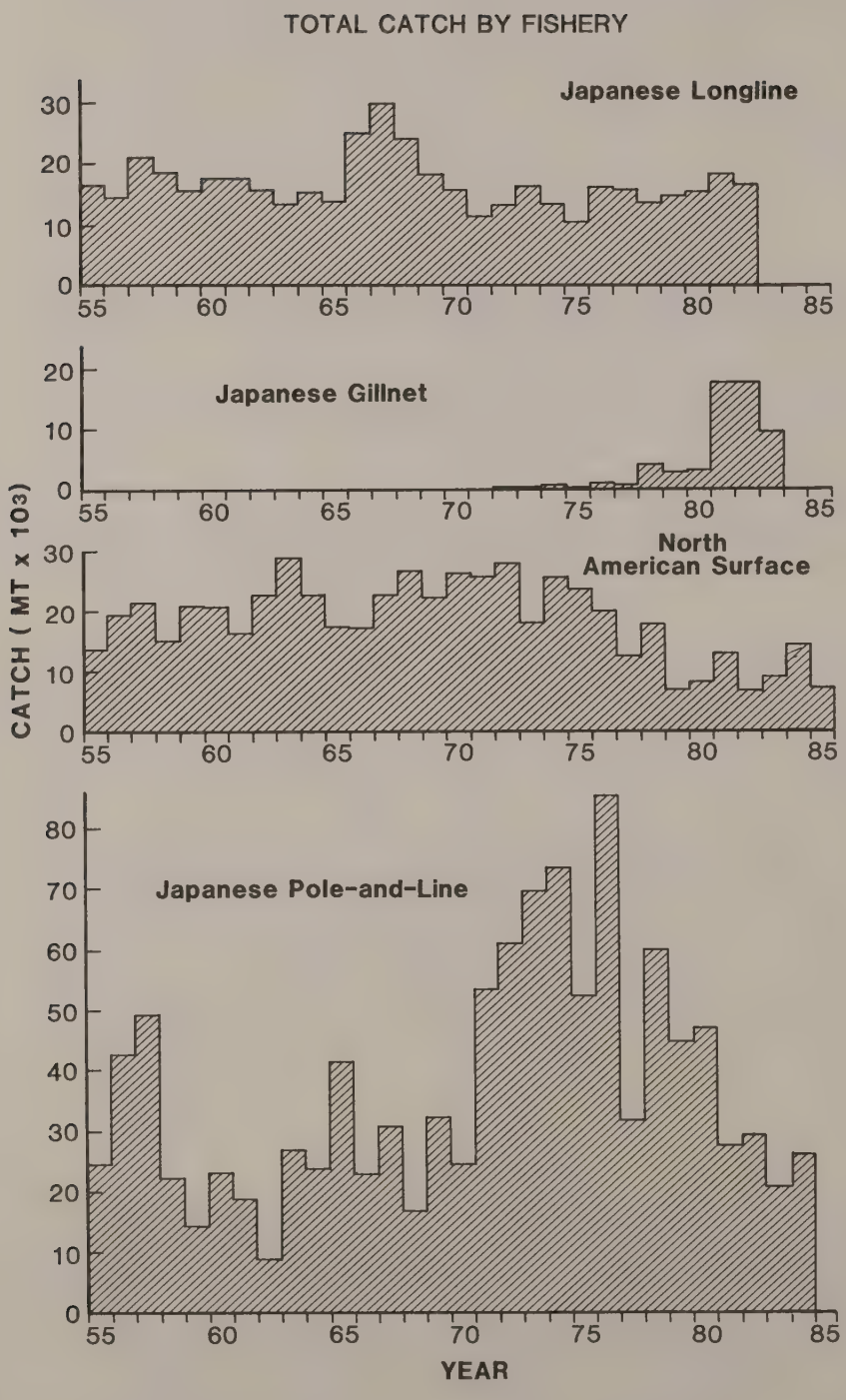

Figure 1. Total catch in metric tons by fishery and gear.

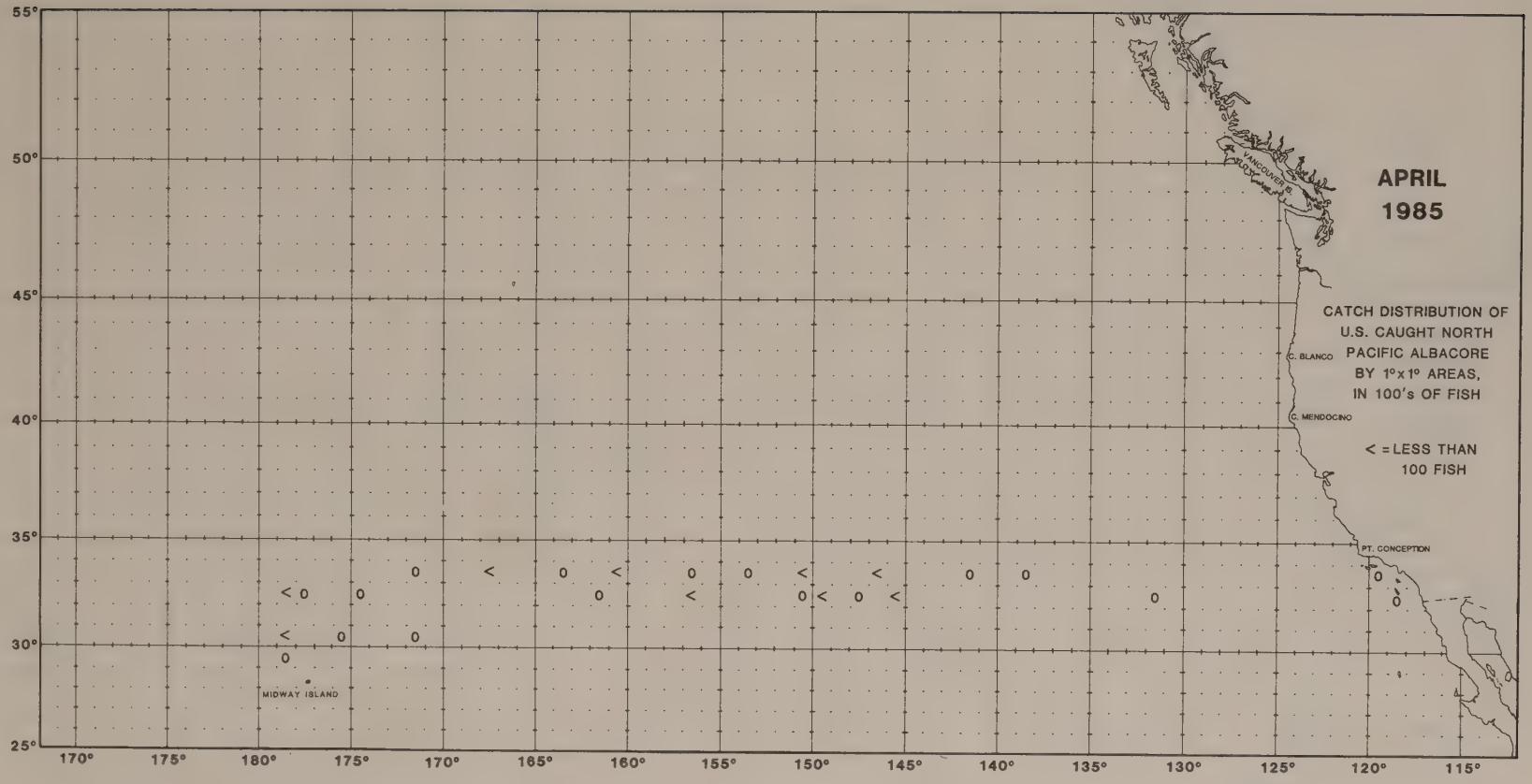

Figure 2a. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, April 1985.

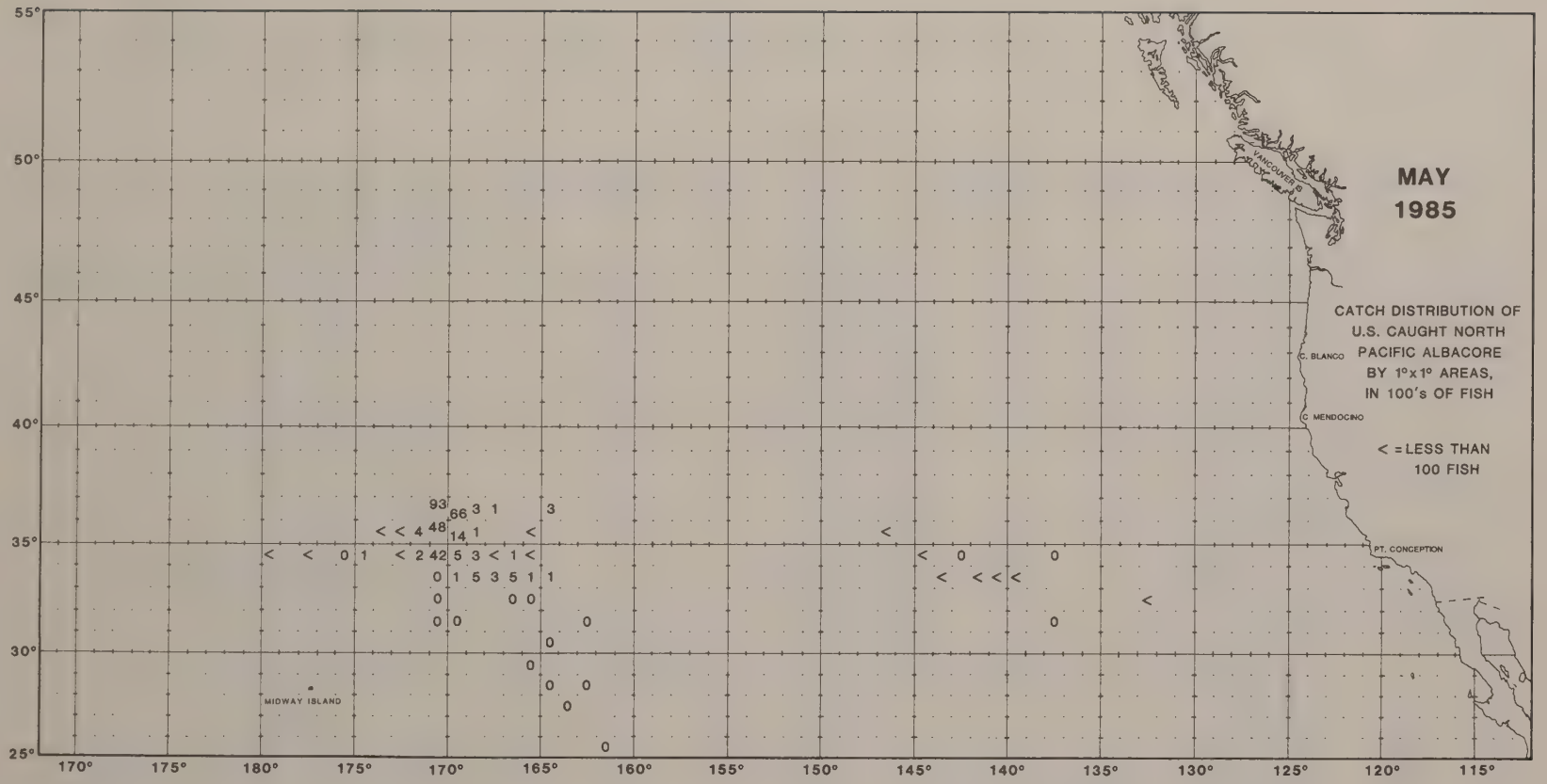

Figure 2b. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, May 1985.

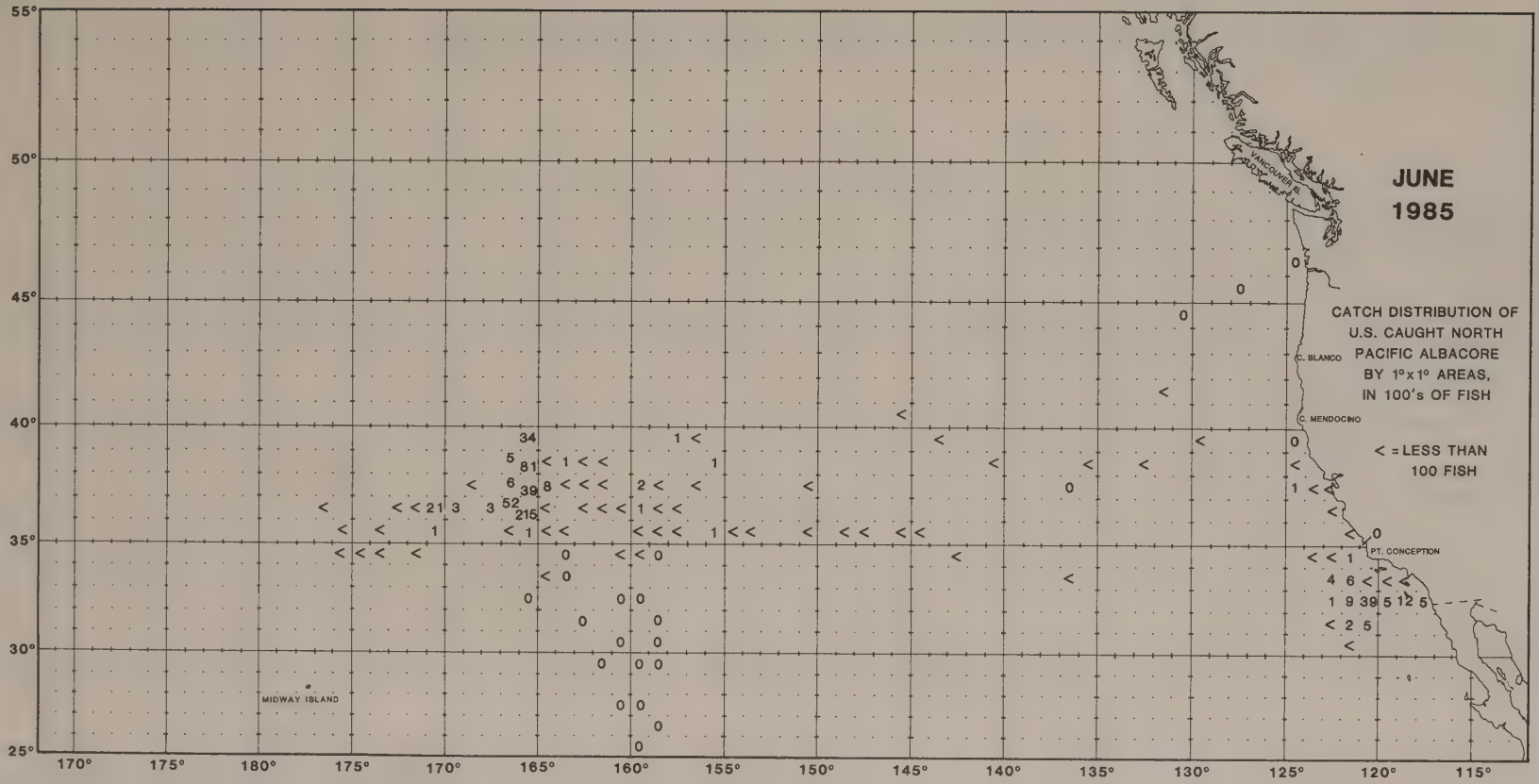

Figure 2c. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, June 1985.

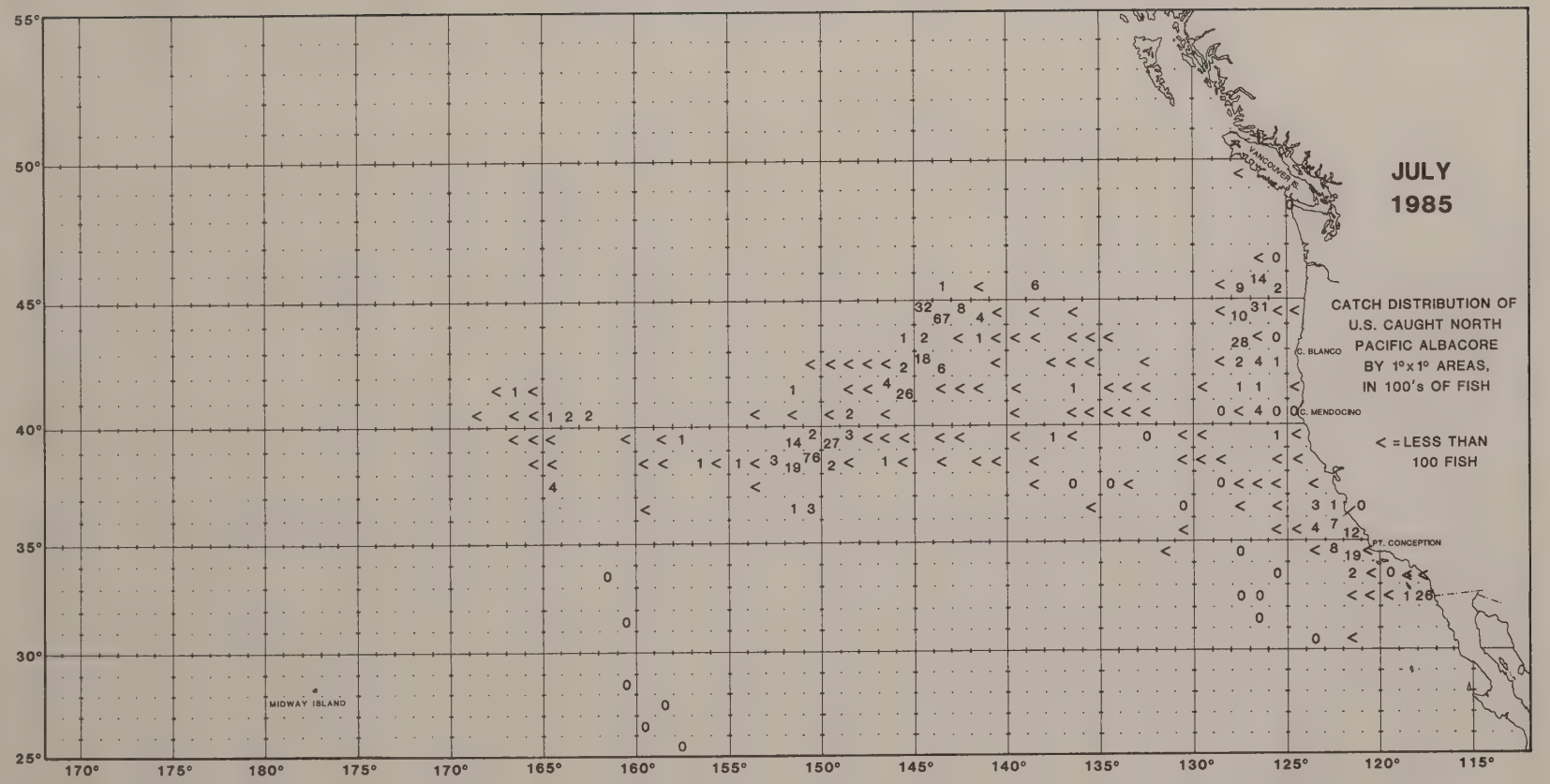

Figure 2d. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, July 1985.

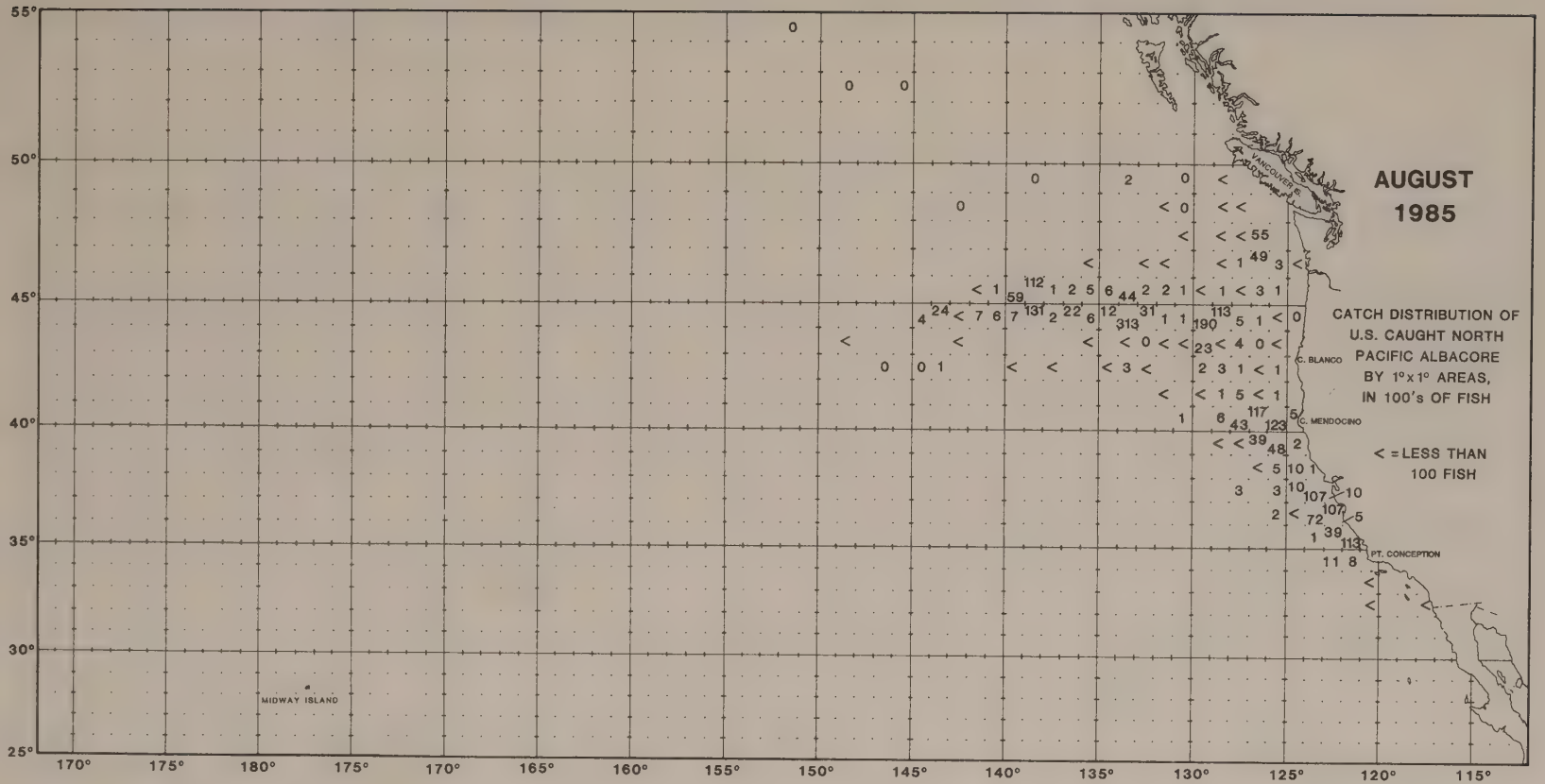

Figure 2e. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, August 1985.

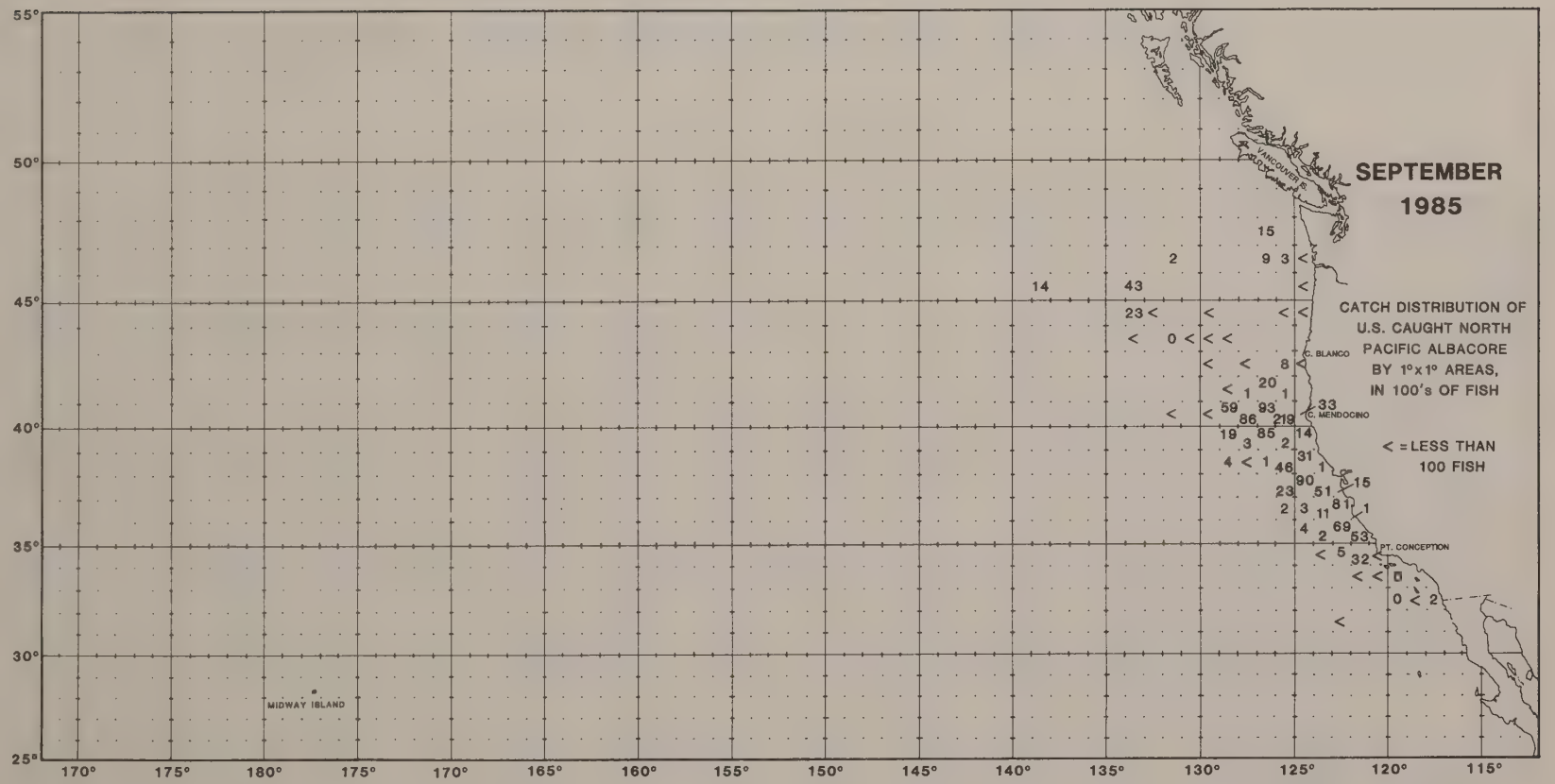

Figure 2f. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, September 1985.

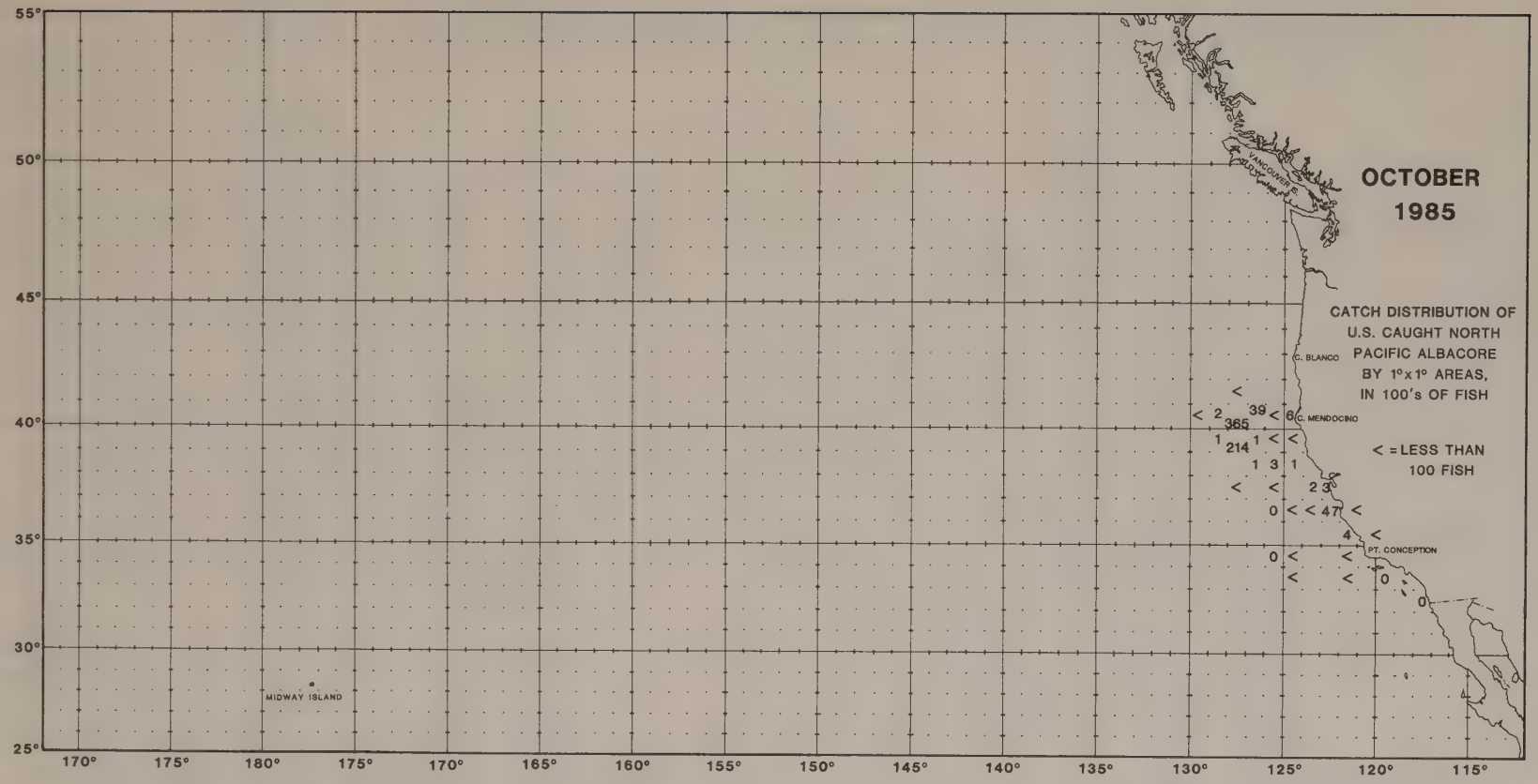

Figure 2g. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, October 1985.

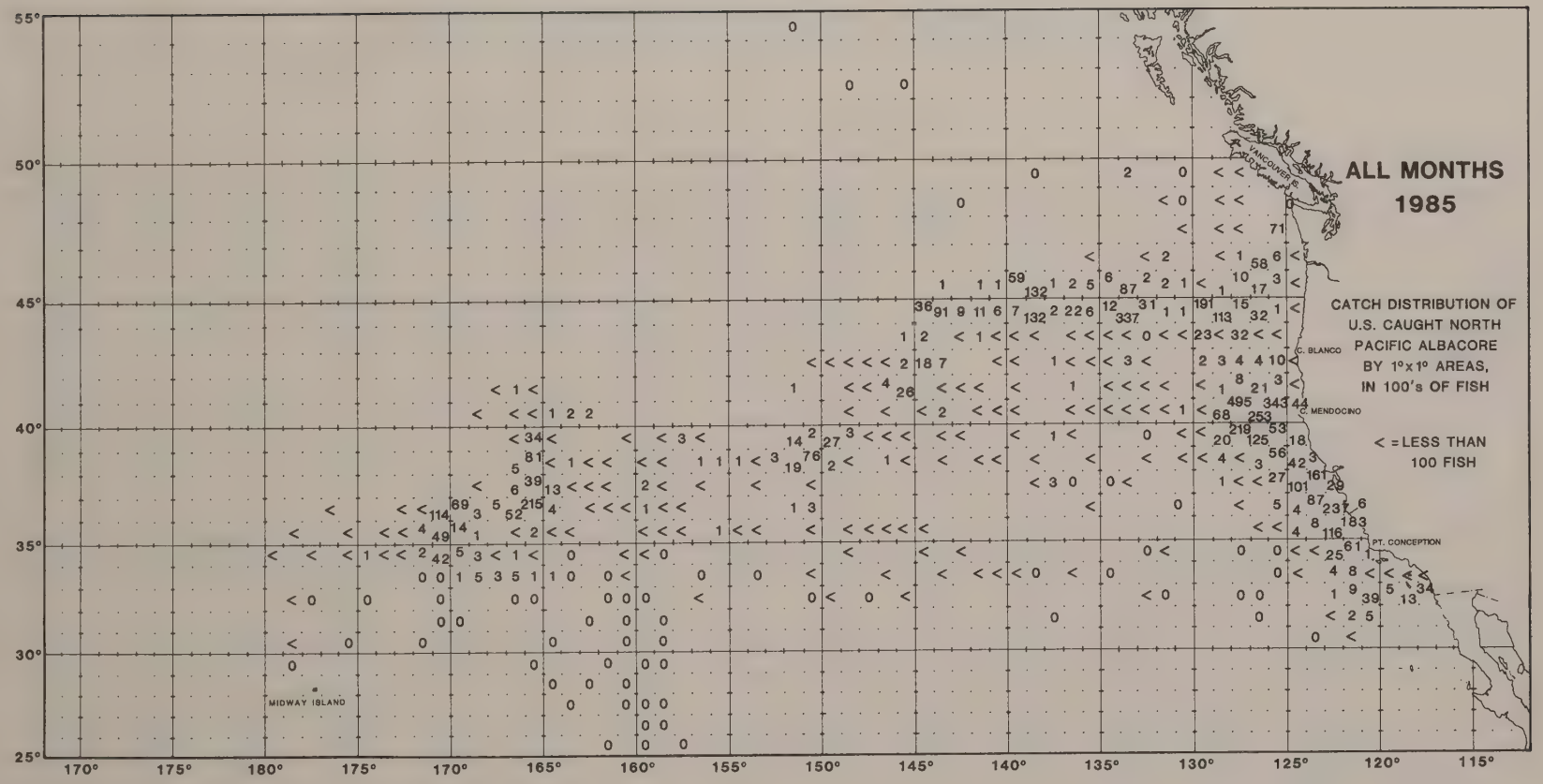

Figure 2h. Combined jigboat and baitboat fishery catches (in numbers of fish) by 1-degree square area, all months 1985.

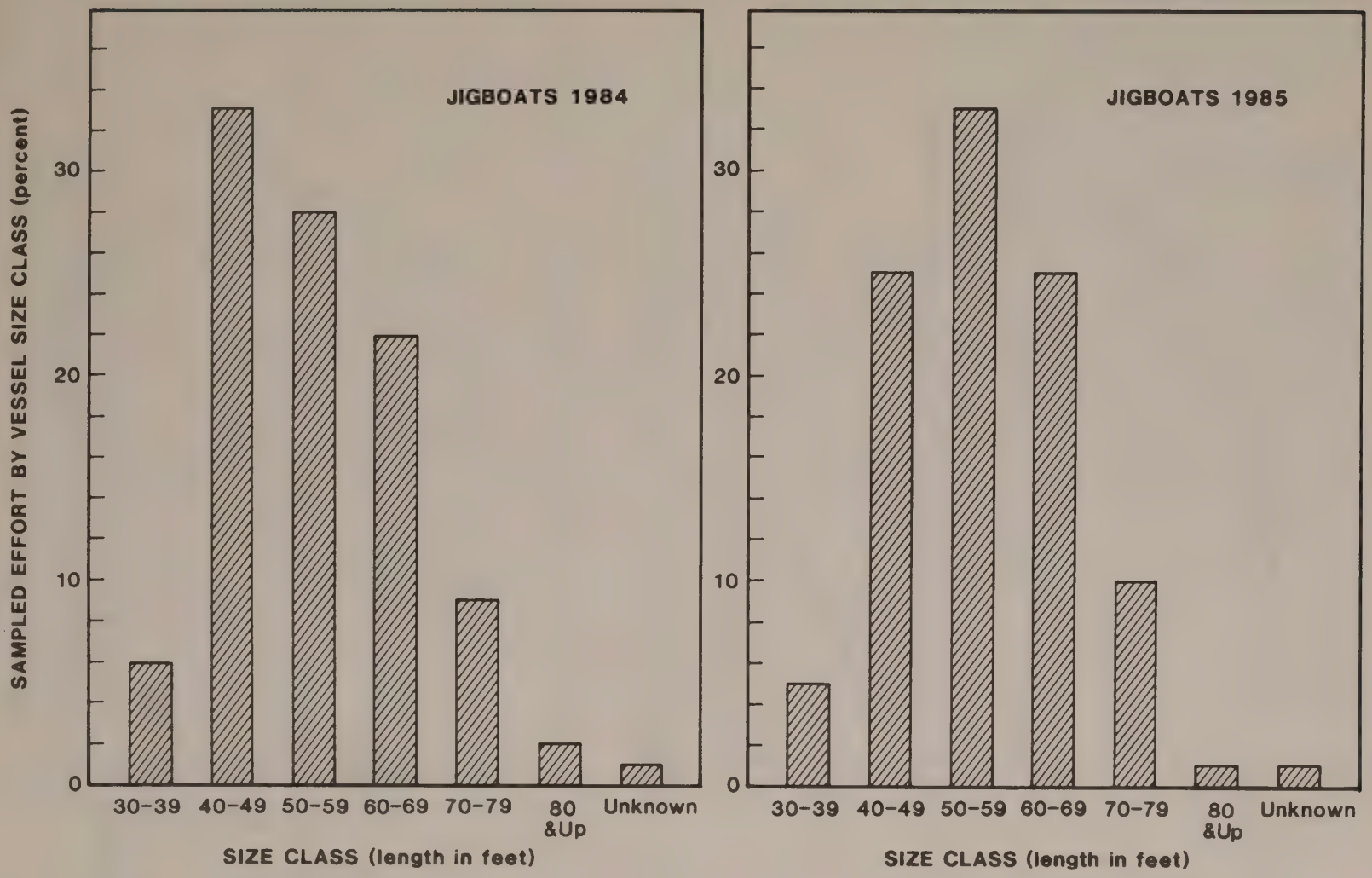

Figure 3. Sampled effort by vessel size class (jigboats) and year.

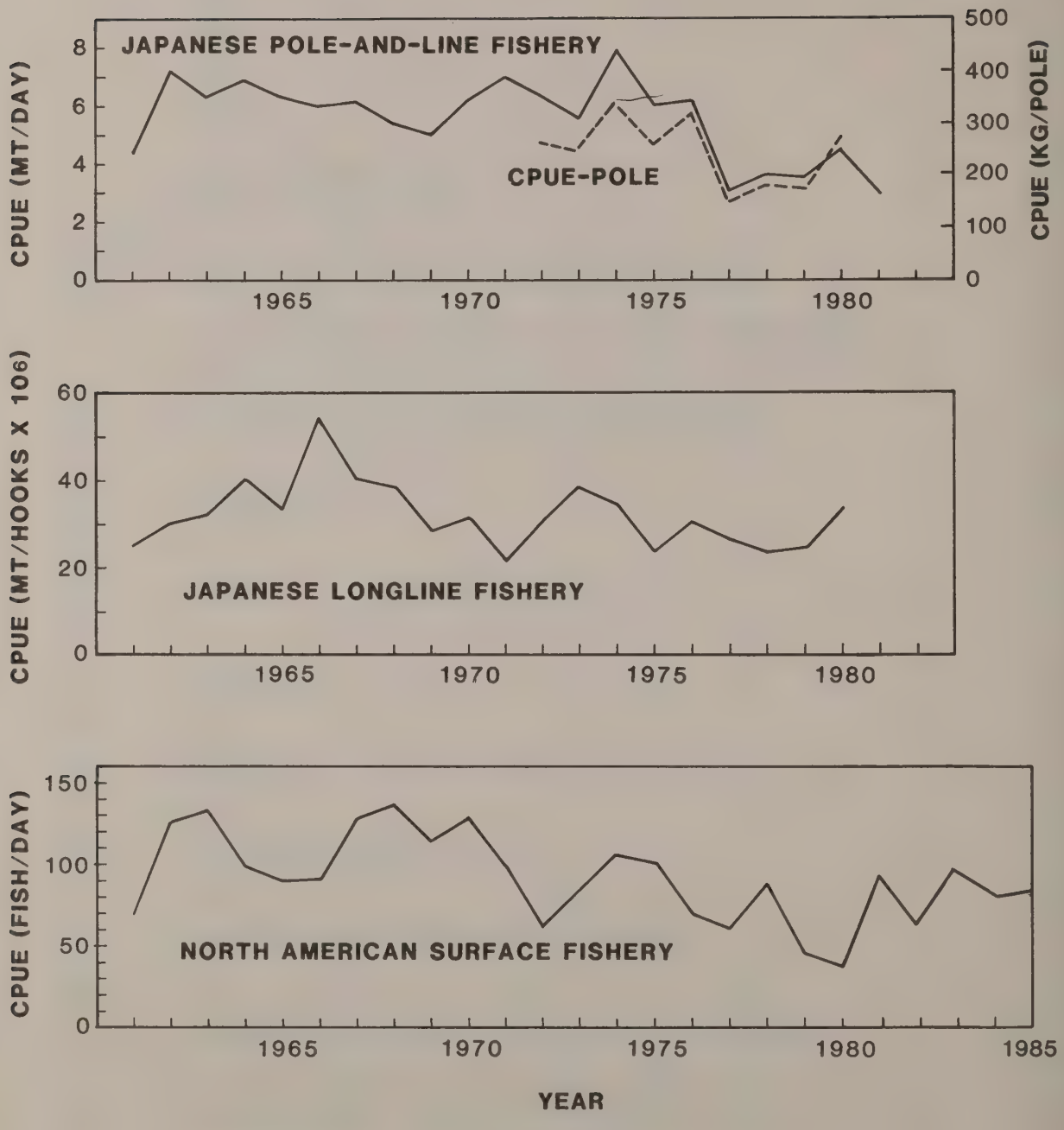

Figure 4. North Pacific albacore catch-per-unit effort (CPUE) by fishery and gear.

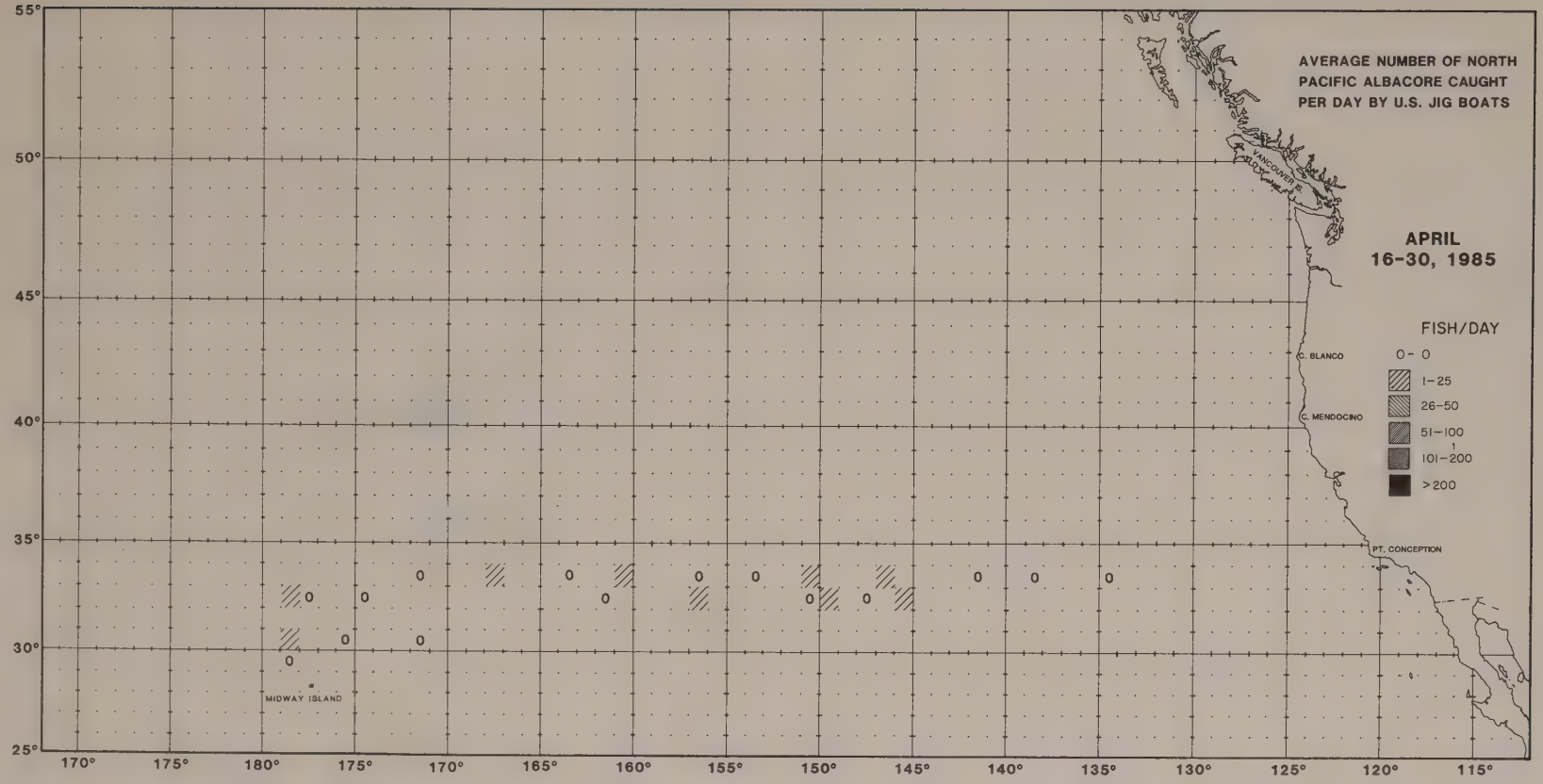

Figure 5a. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, April 16-30, 1985.

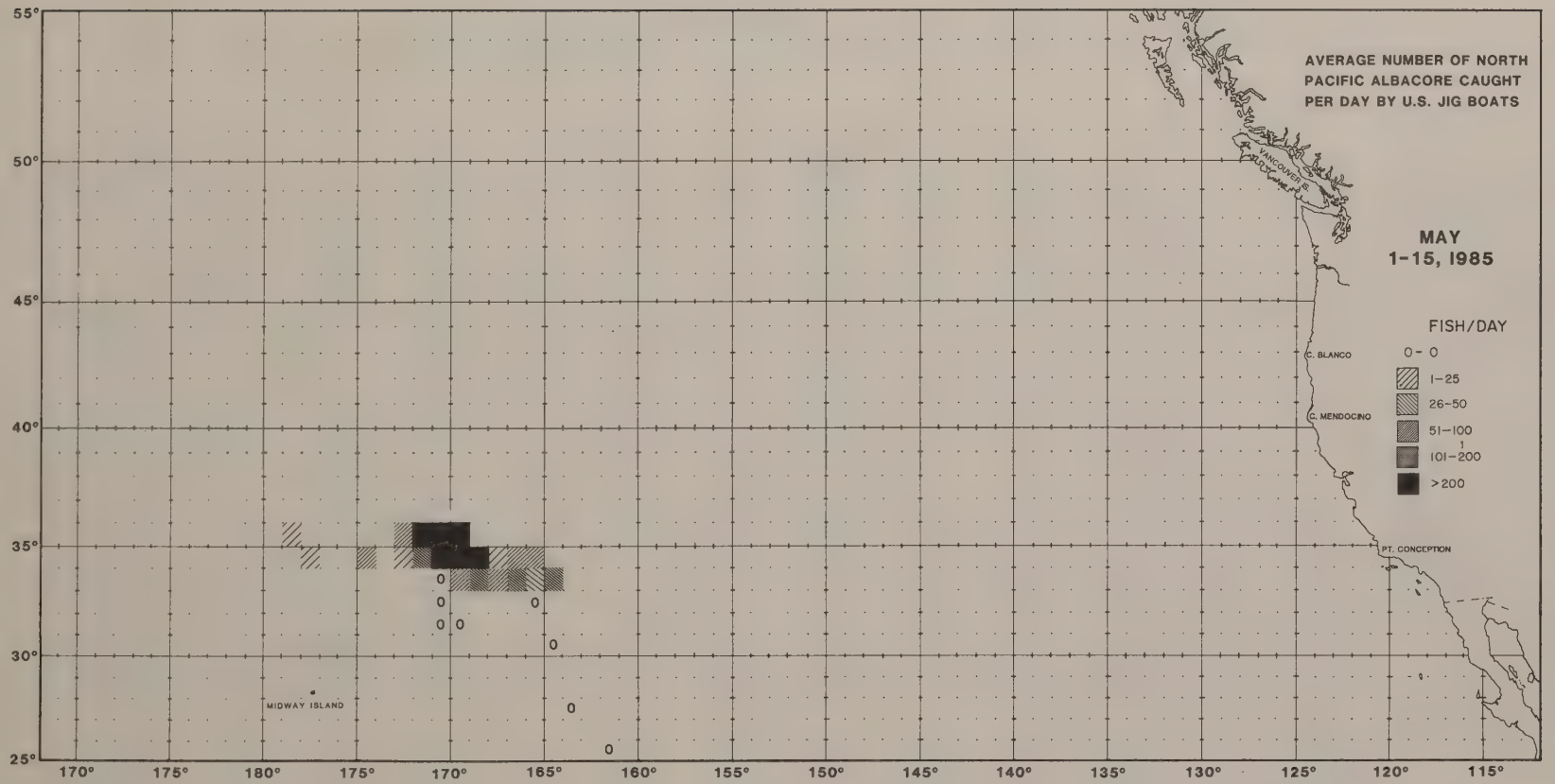

Figure 5b. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, May 1-15, 1985.

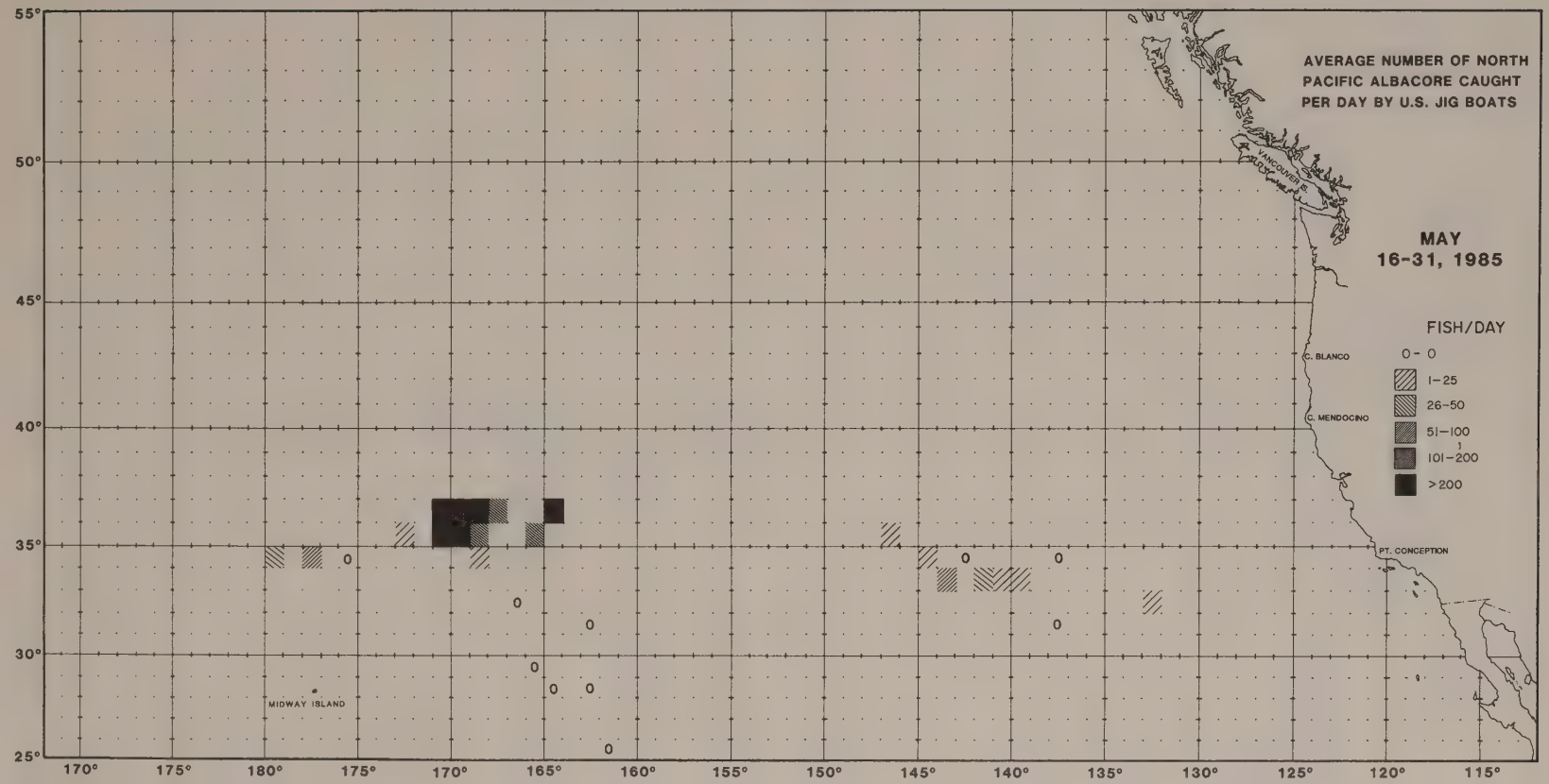

Figure 5c. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, May 16-31, 1985.

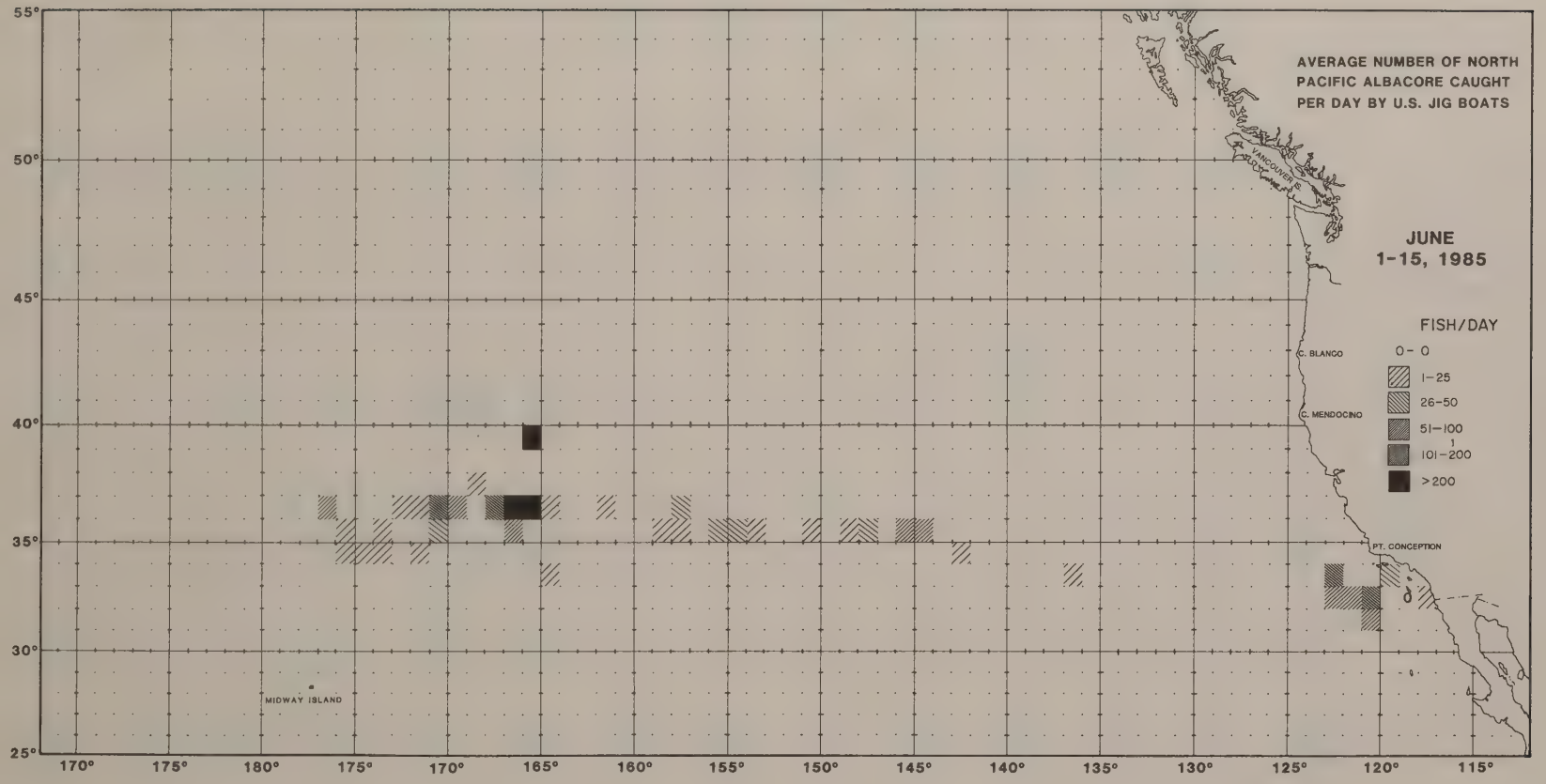

Figure 5d. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, June 1-15, 1985.

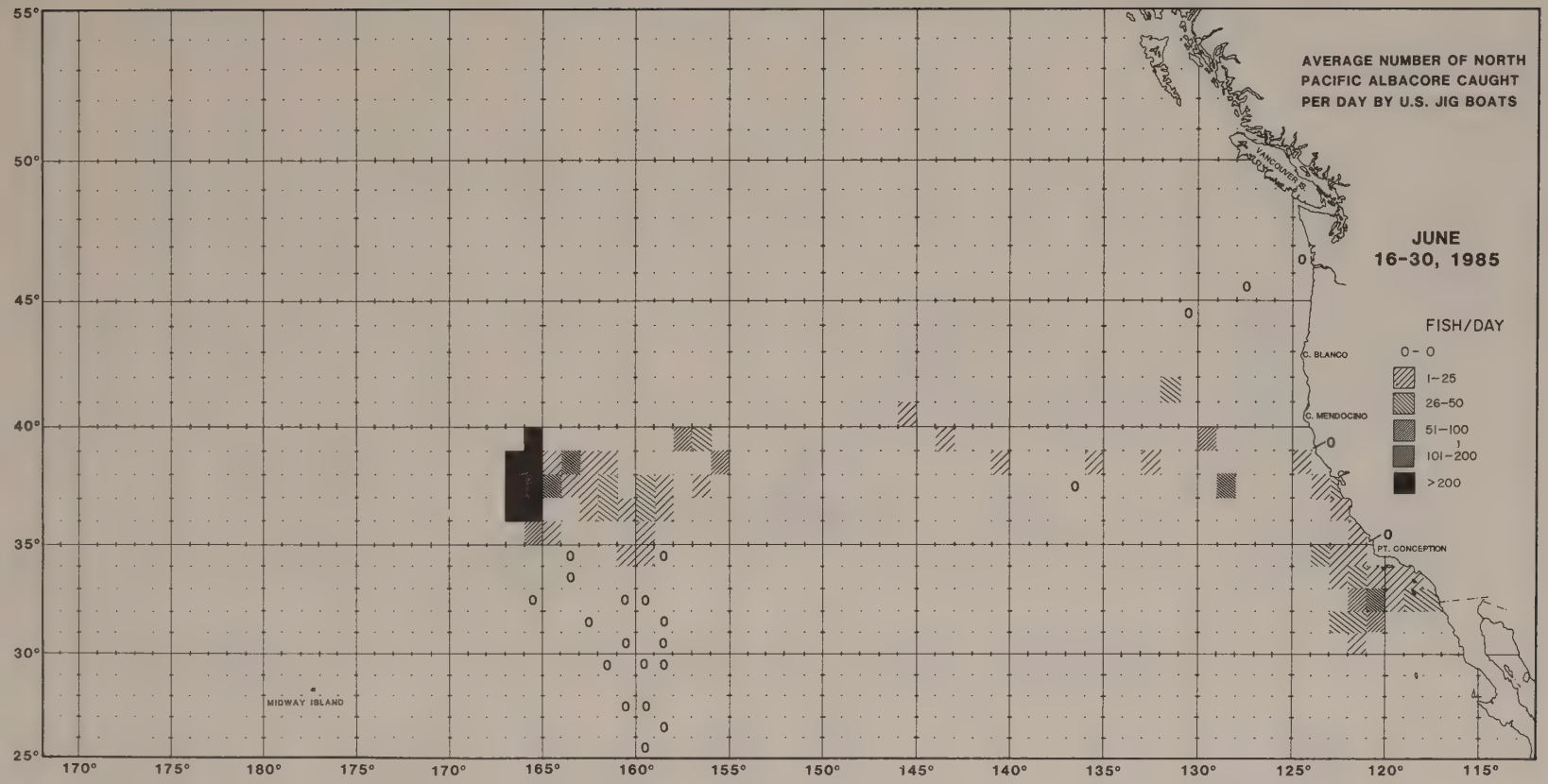

Figure 5e. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, June 16-30, 1985.

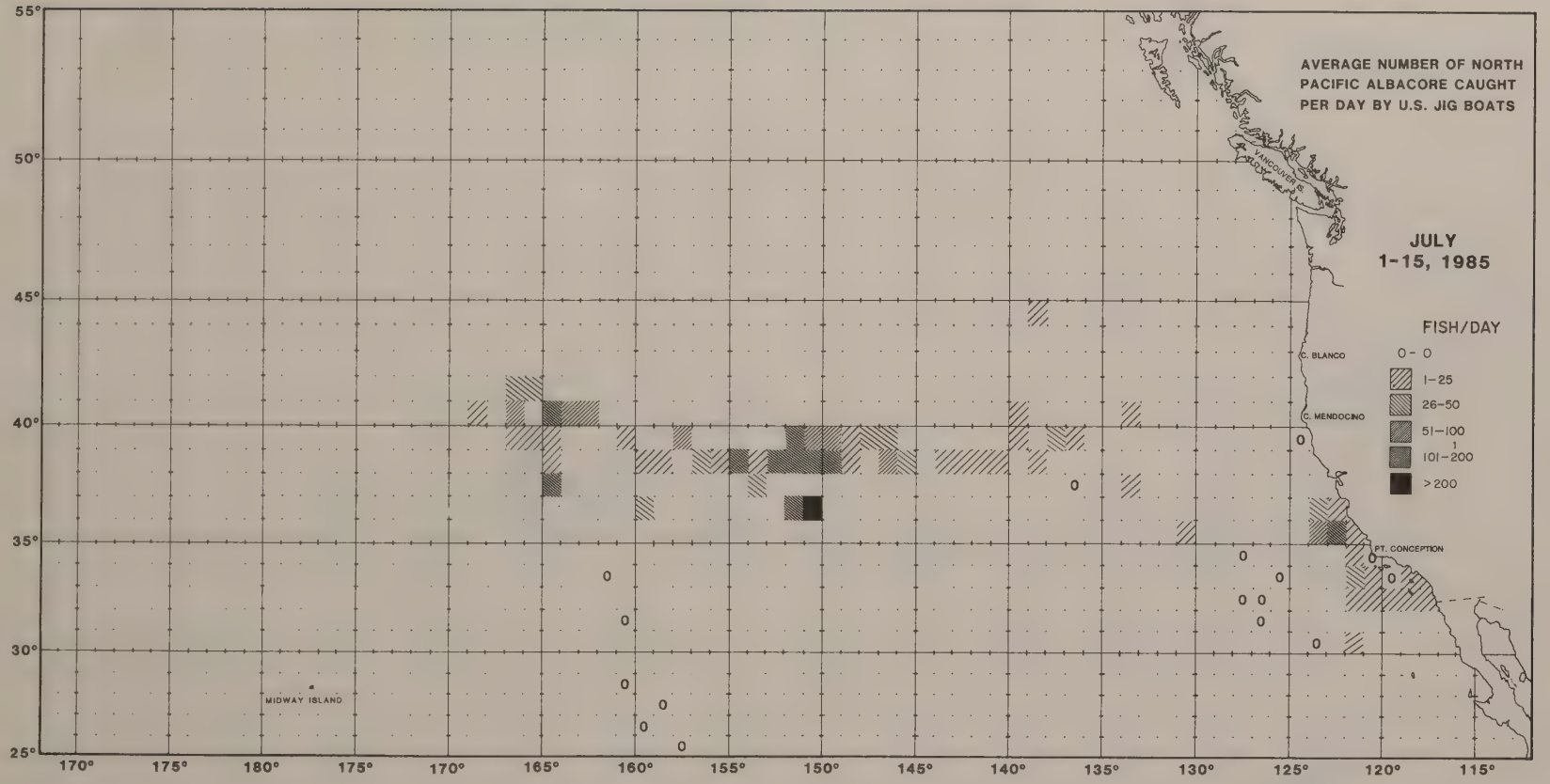

Figure 5f. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, July 1-15, 1985.

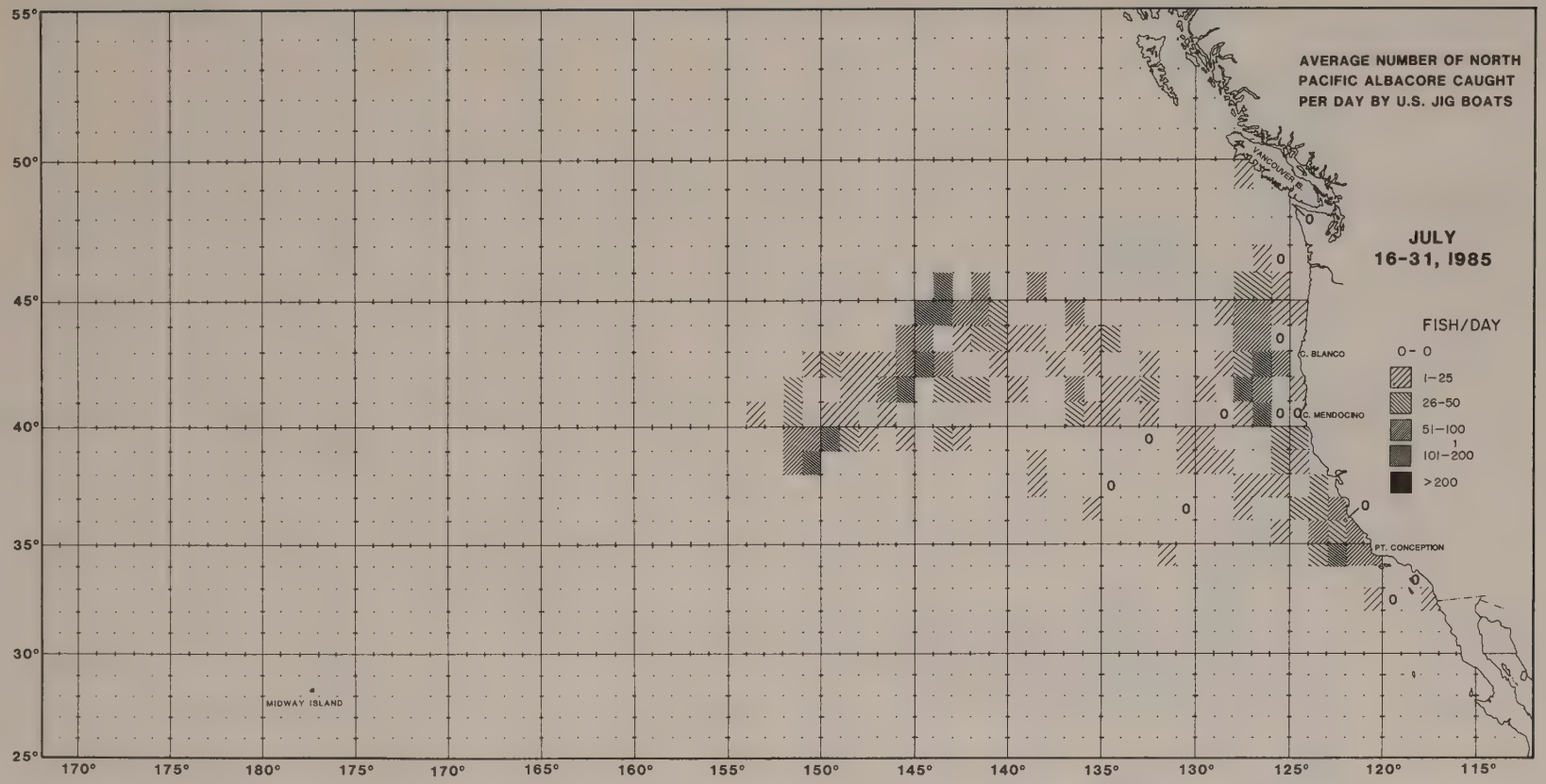

Figure 5g. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, July 16-31, 1985.

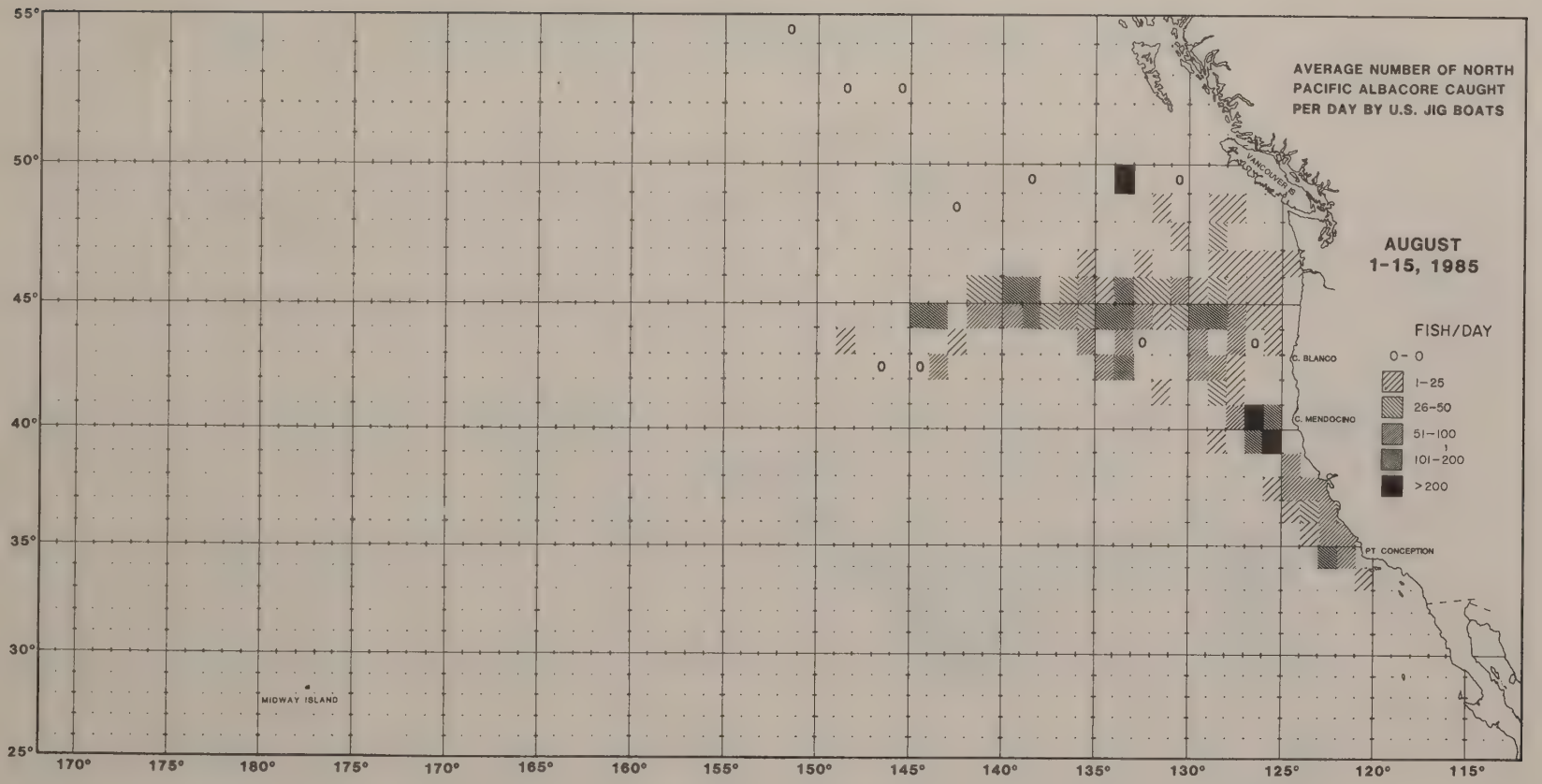

Figure 5h. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, August 1-15, 1985.

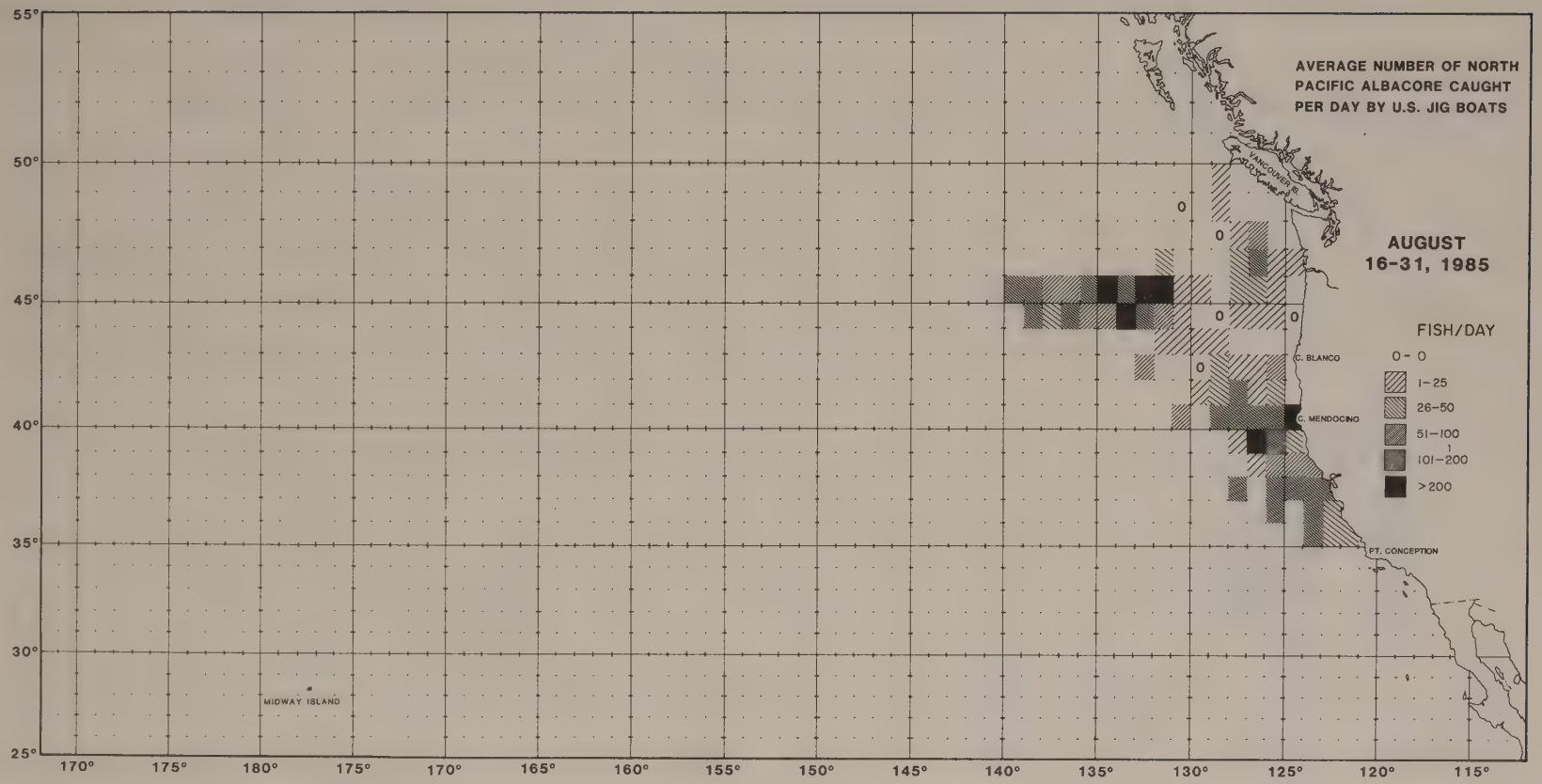

Figure 5i. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, August 16-31, 1985.

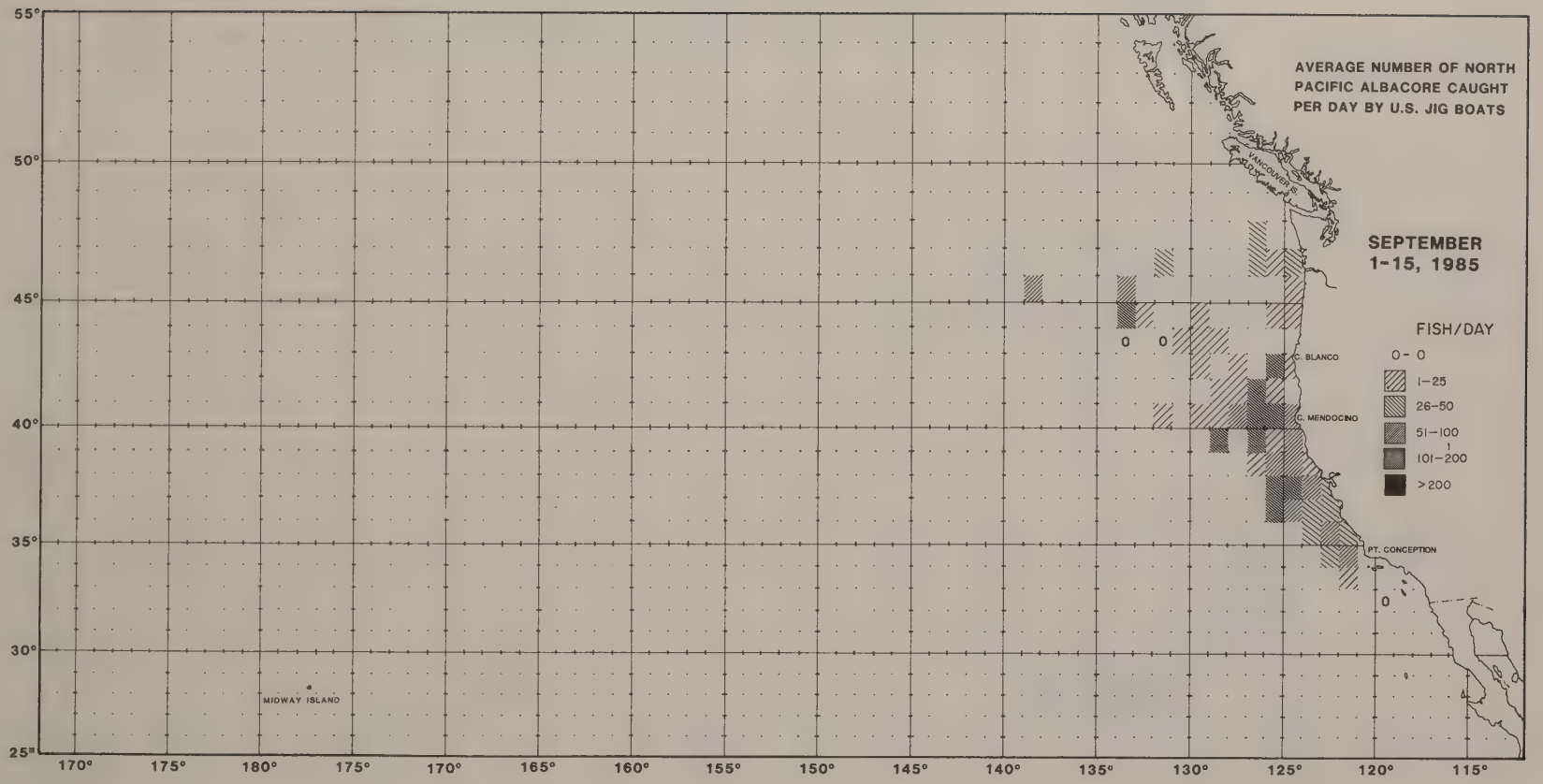

Figure 5j. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, September 1-15, 1985.

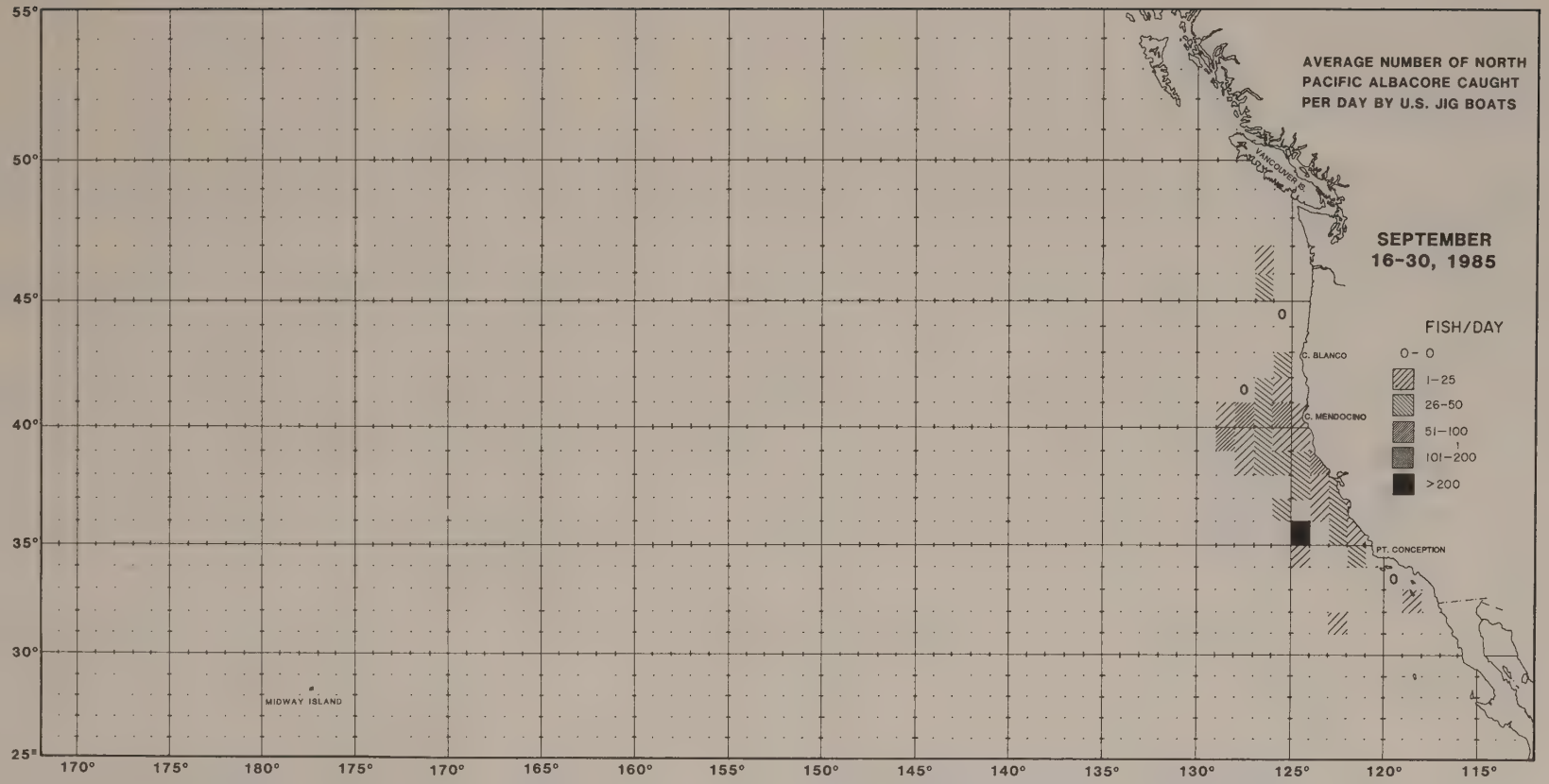

Figure 5k. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, September 16-30, 1985.

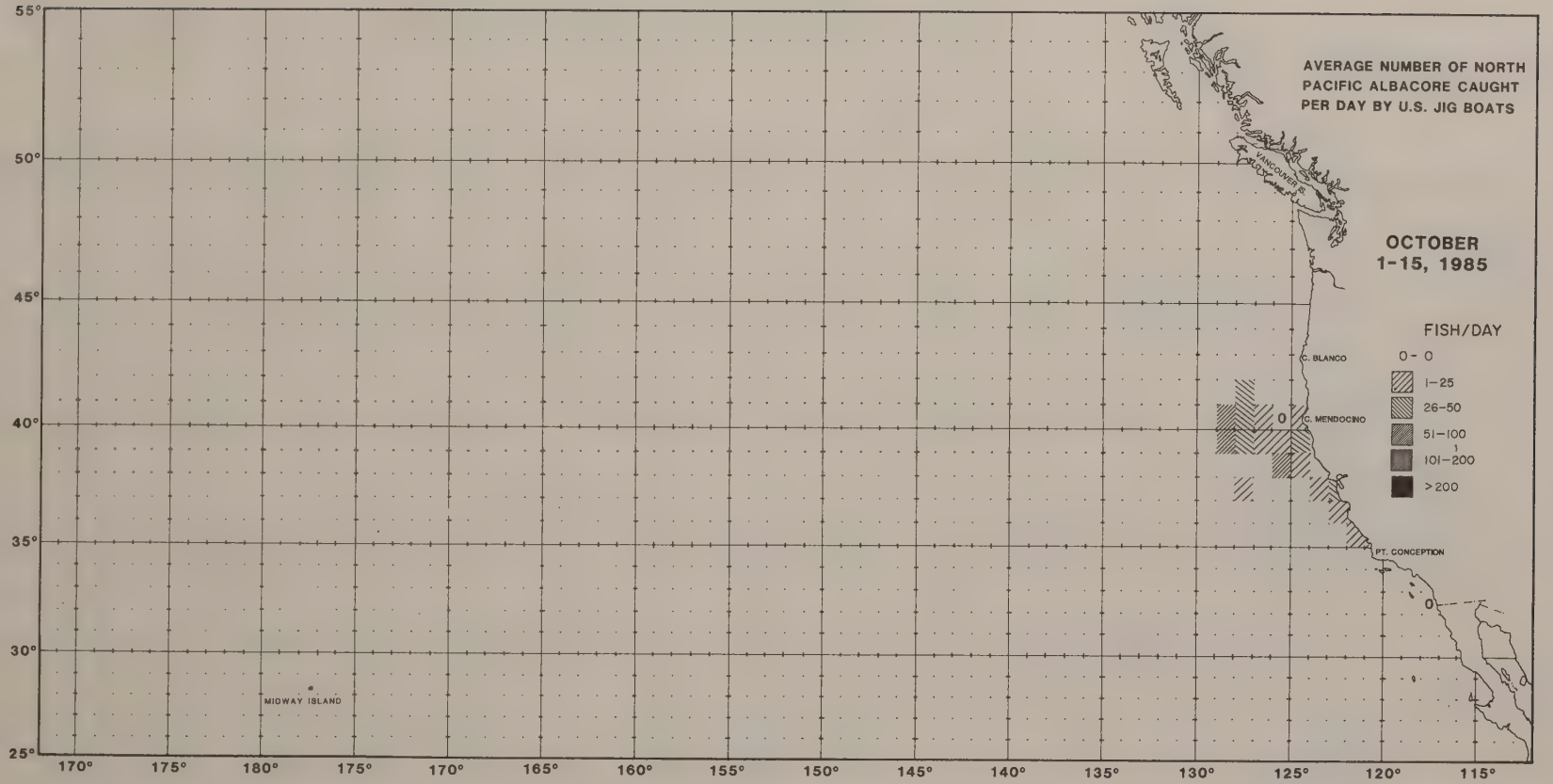

Figure 51. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, October 1-15, 1985.

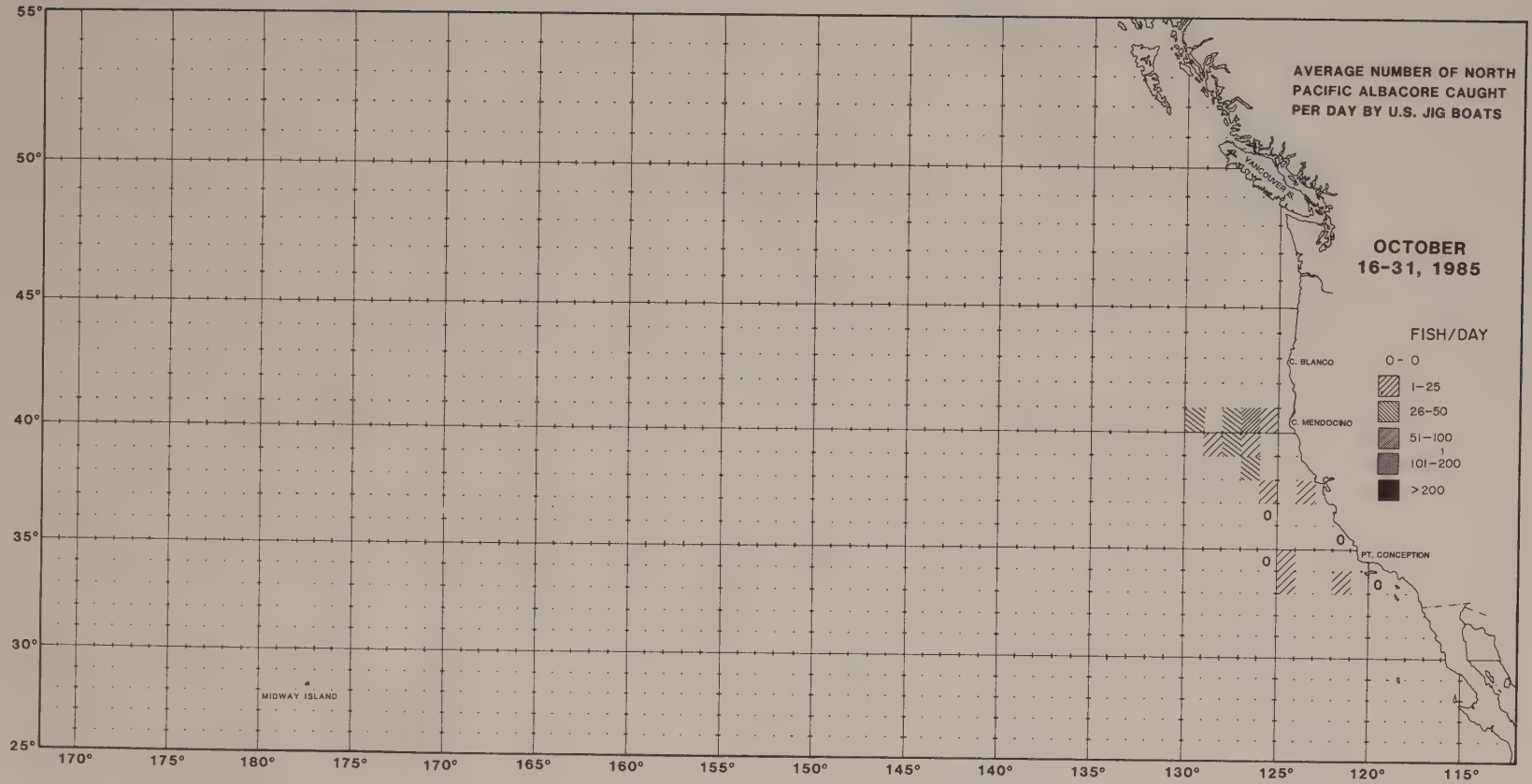

Figure 5m. Jigboat catch-per-standard day fishing by 1-degree square area and half-month, October 16-31, 1985.

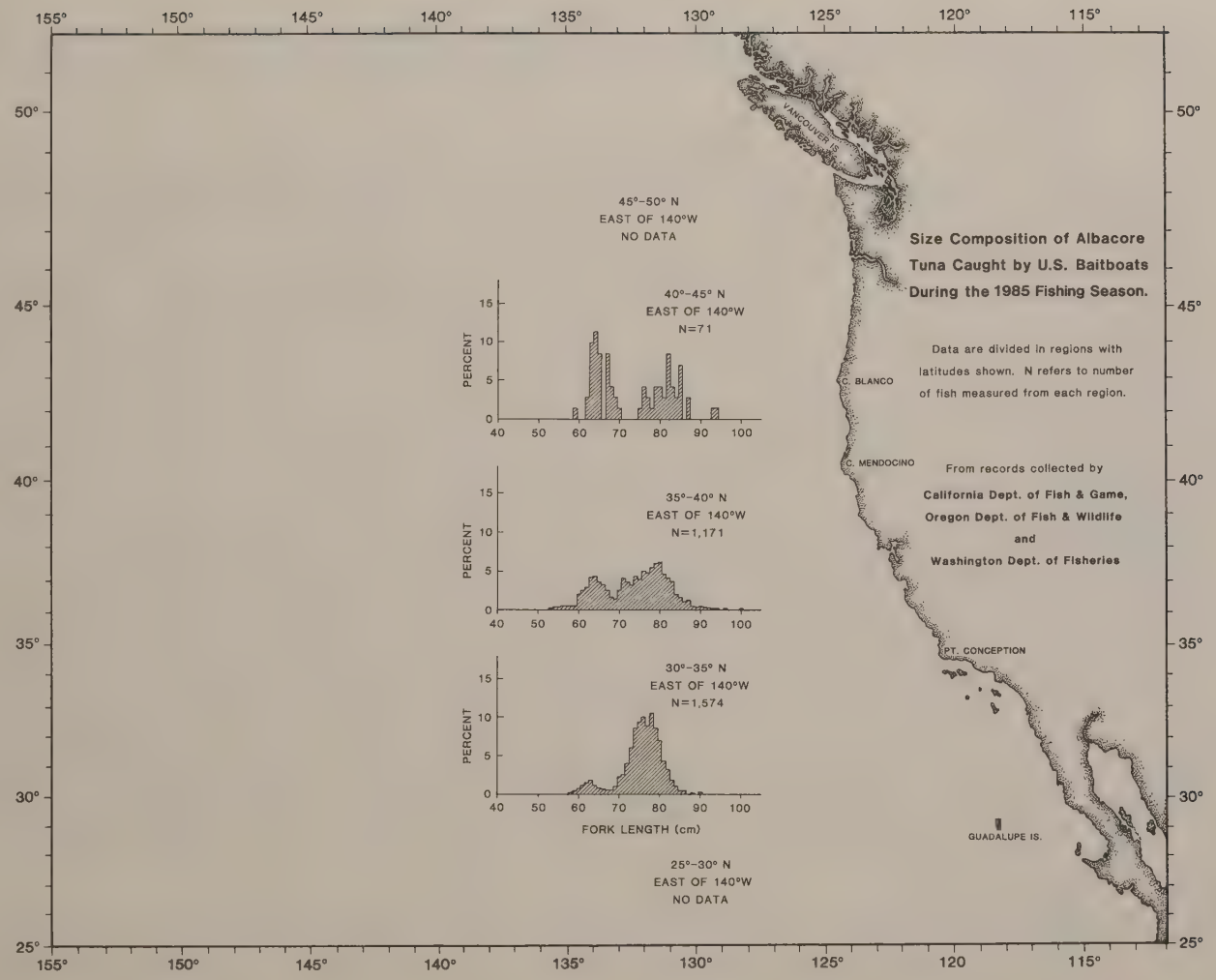

Figure 6a. Length-frequency histograms of the 1985 North Pacific albacore caught by the U.S. baitboat fishery.

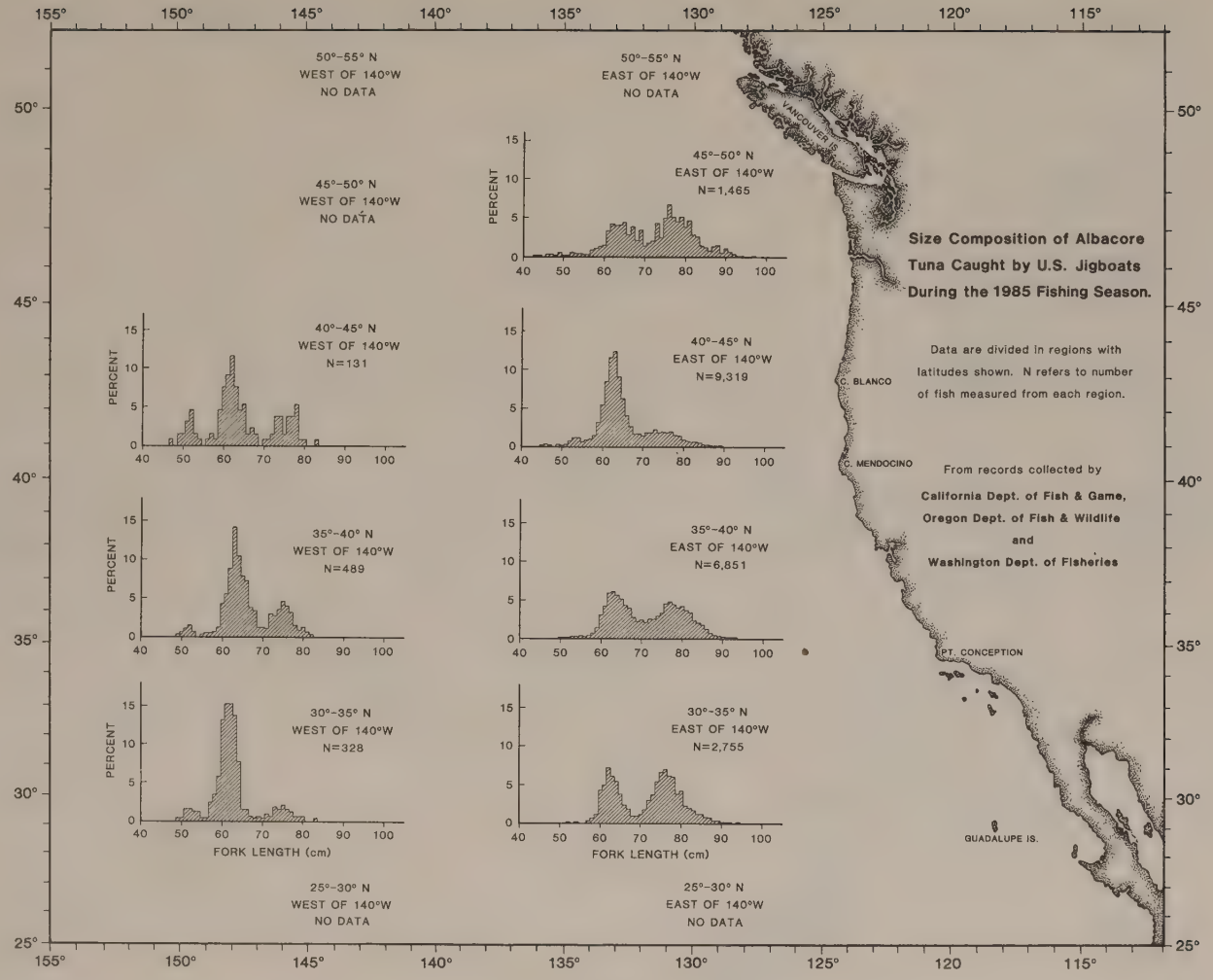

Figure 6b. Length-frequency histograms of the 1985 North Pacific albacore caught by the U.S. jigboat fishery.

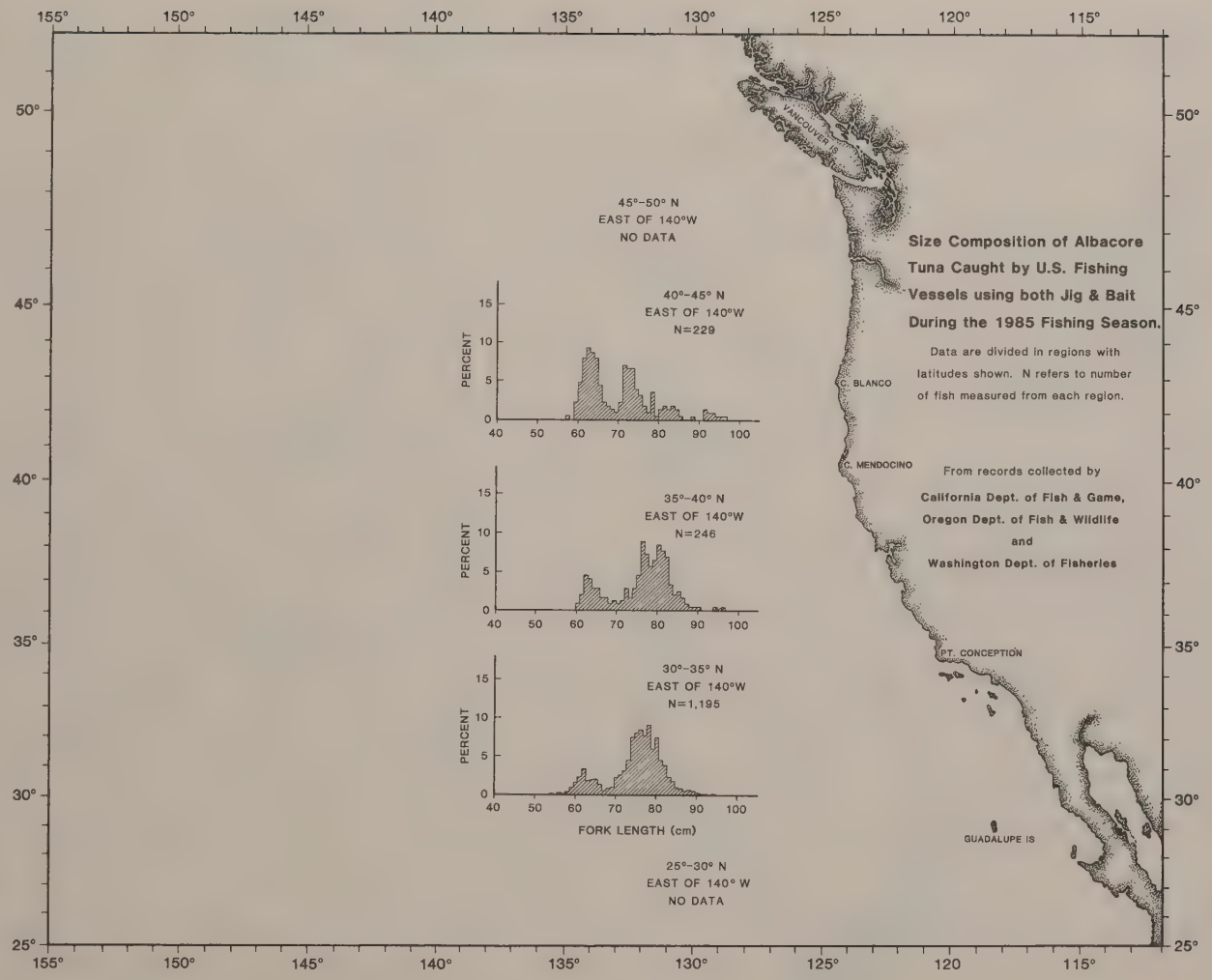

Figure 6c. Length-frequency histograms of the 1985 North Pacific albacore caught by U.S. vessels using both bait and jig.

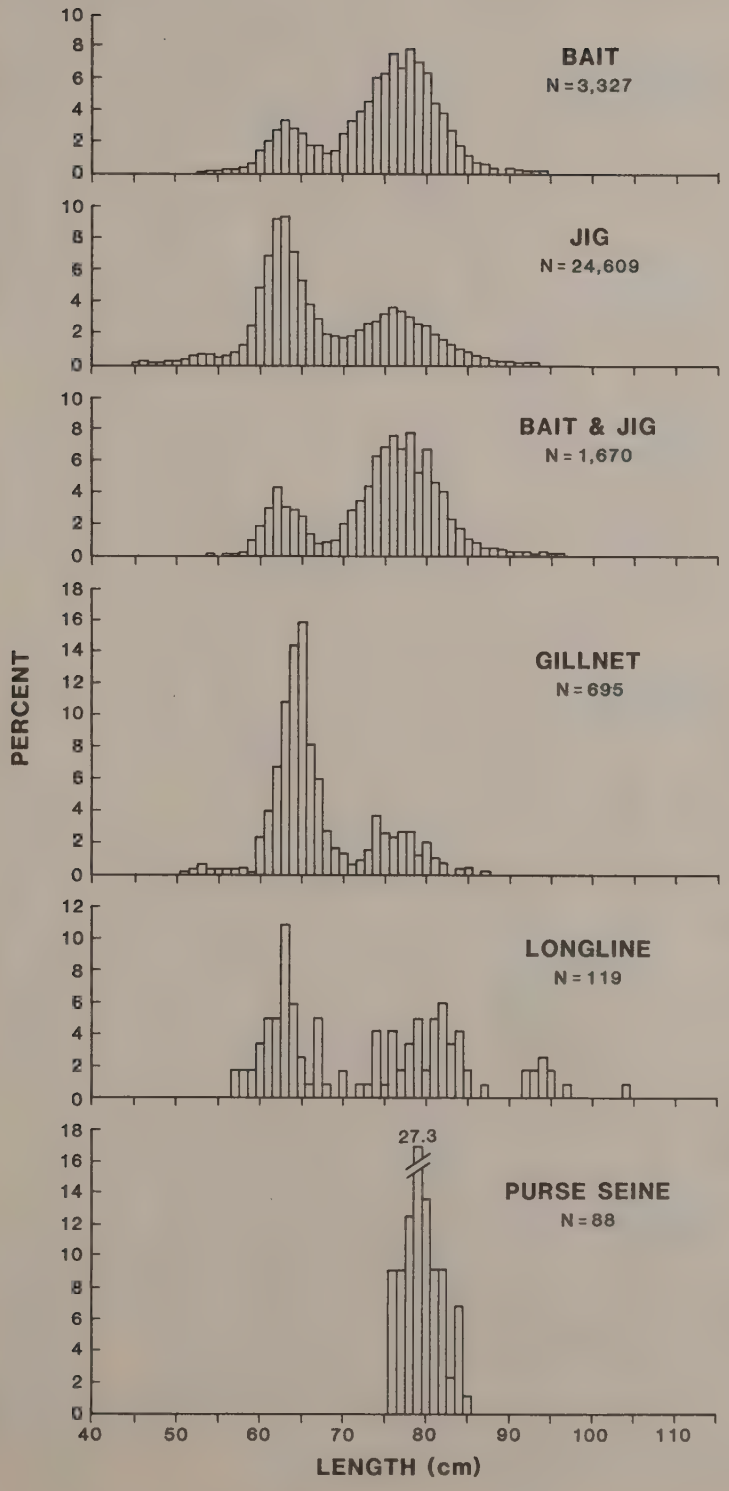

Figure 7. Size composition of albacore tuna caught by the U.S. fleet for 1985 by gear

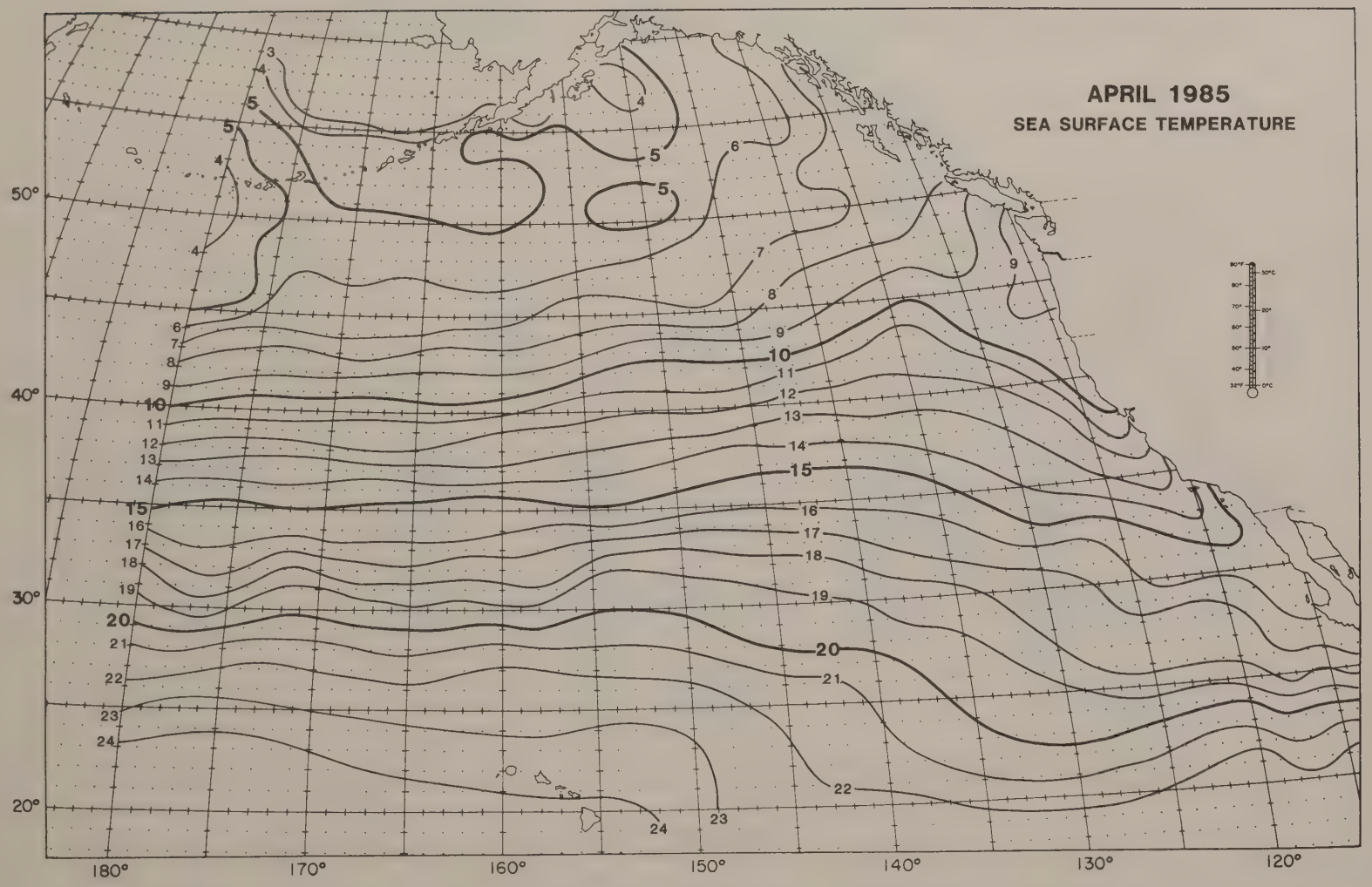

Figure 8a. Average sea-surface temperature (SST) isopleths (°C) by month for the eastern Pacific Ocean, April 1985.

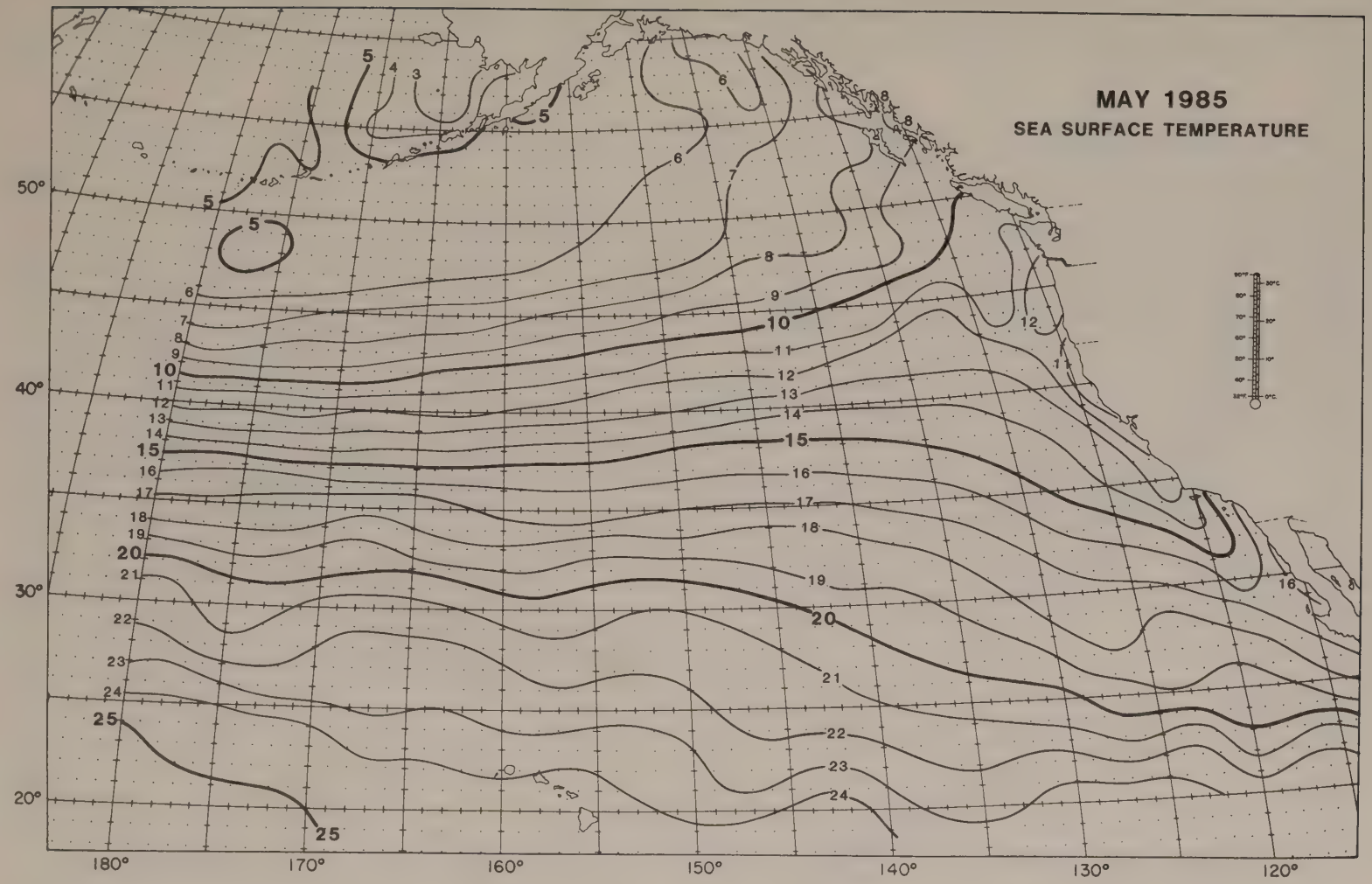

Figure 8b. Average sea-surface temperature (SST) isopleths (^{o}C) by month for the eastern Pacific Ocean, May 1985.

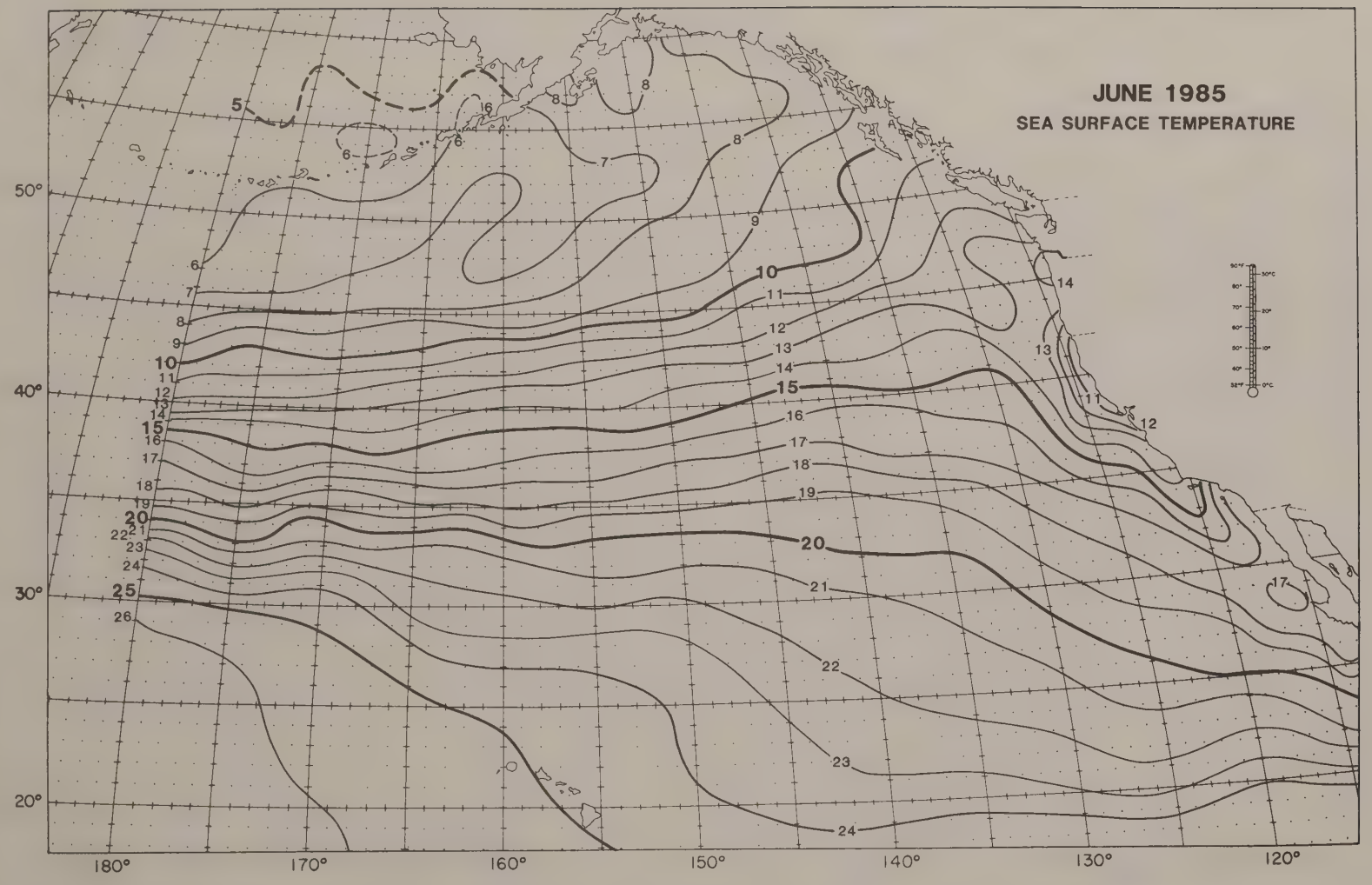

Figure 8c. Average sea-surface temperature (SST) isopleths (^{o}C) by month for the eastern Pacific Ocean, June 1985.

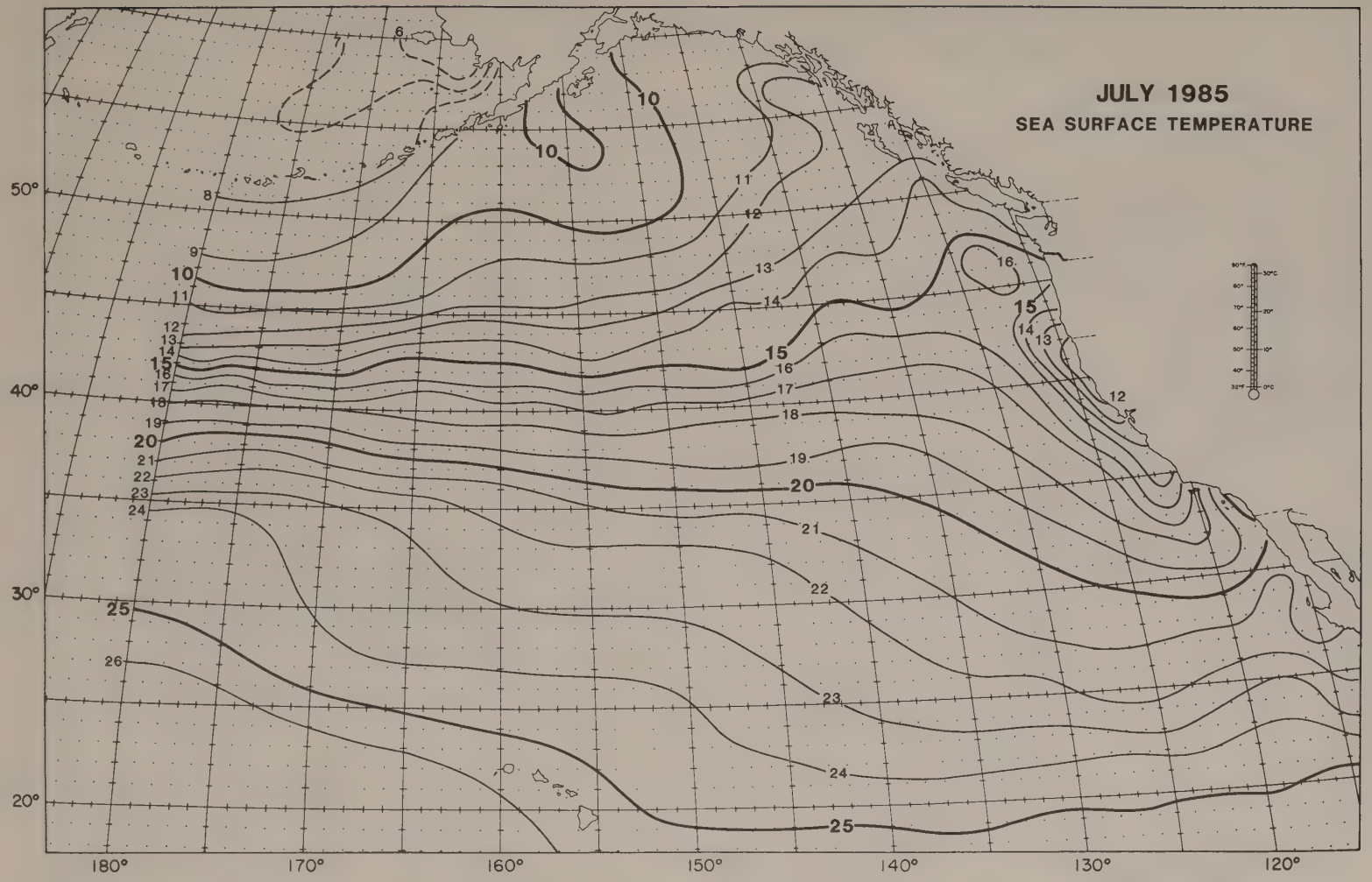

Figure 8d. Average sea-surface temperature (SST) isopleths (°C) by month for the eastern Pacific Ocean, July 1985.

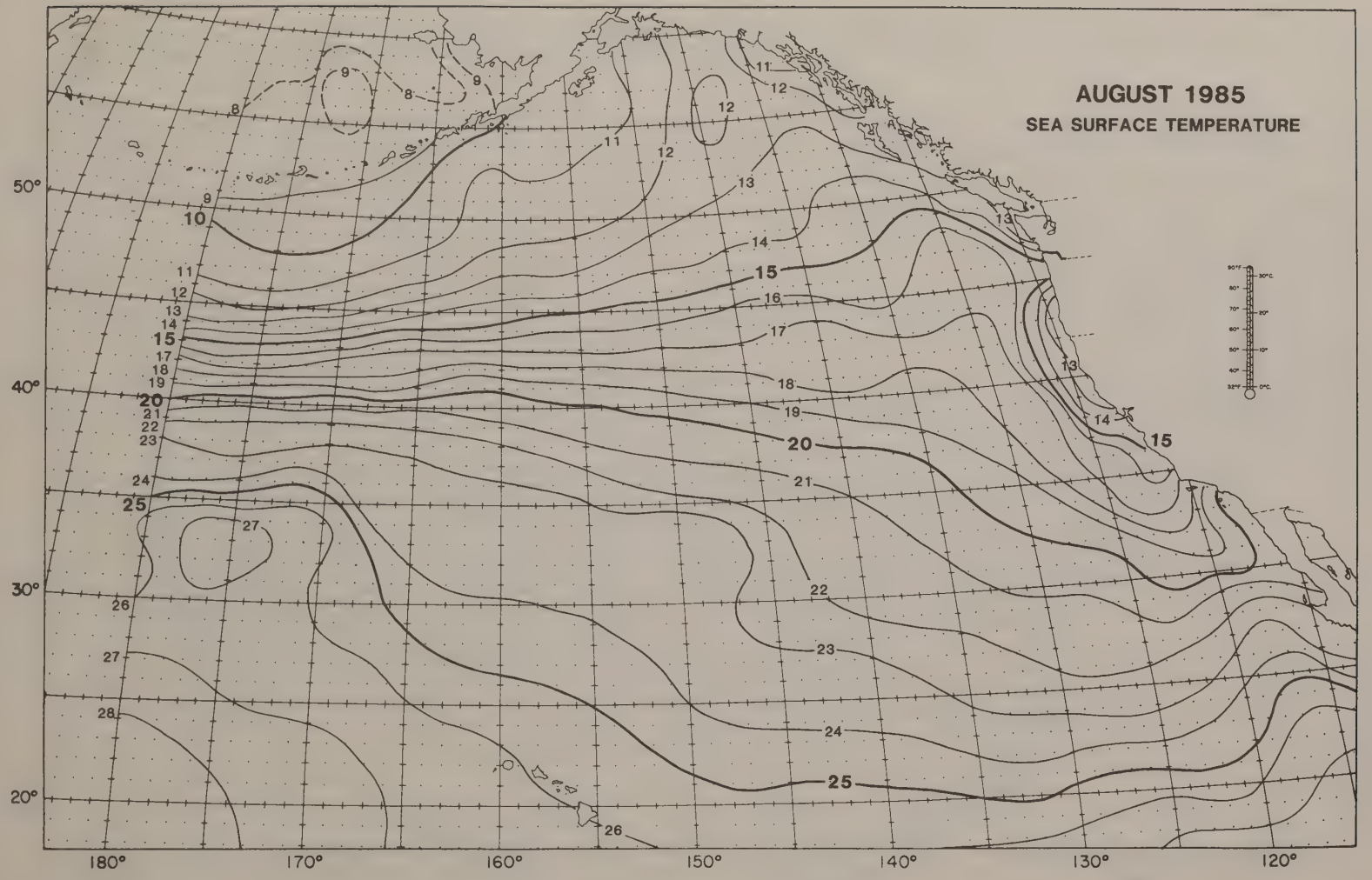

Figure 8e. Average sea-surface temperature (SST) isopleths (°C) by month for the eastern Pacific Ocean, August 1985.

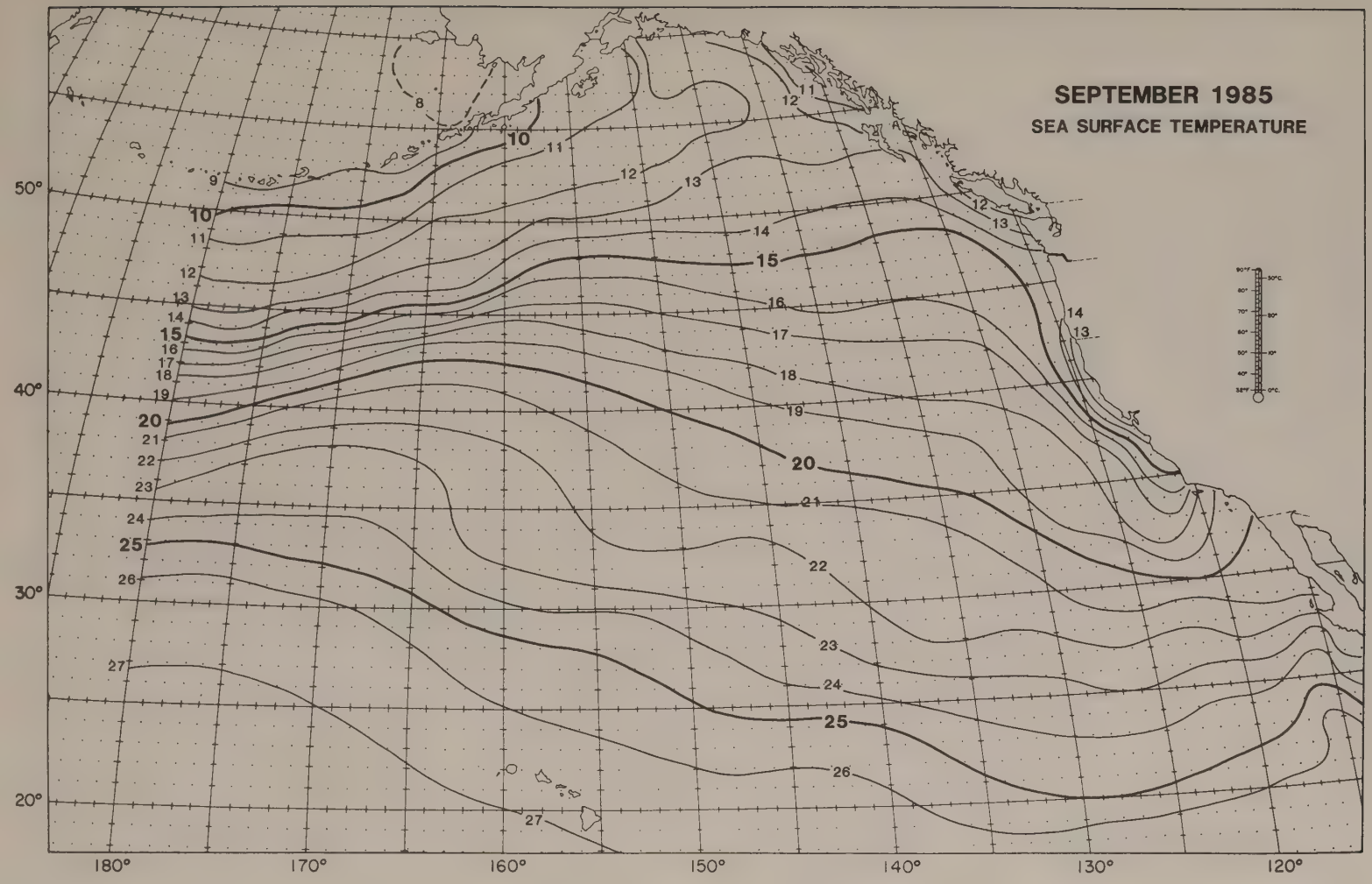

Figure 8f. Average sea-surface temperature (SST) isopleths (^{o}C) by month for the eastern Pacific Ocean, September 1985.

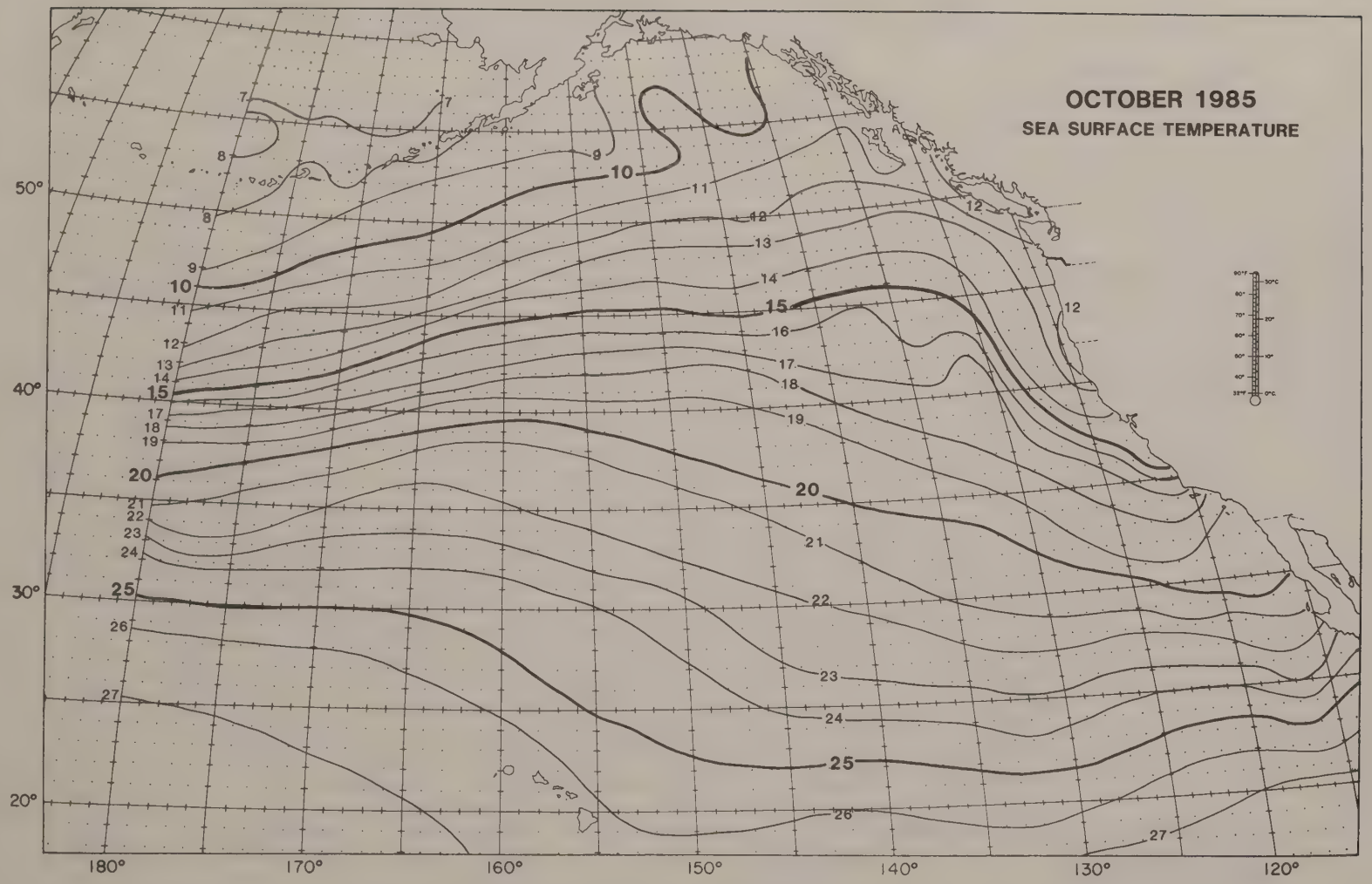

Figure 8g. Average sea-surface temperature (SST) isopleths (°C) by month for the eastern Pacific Ocean, October 1985.

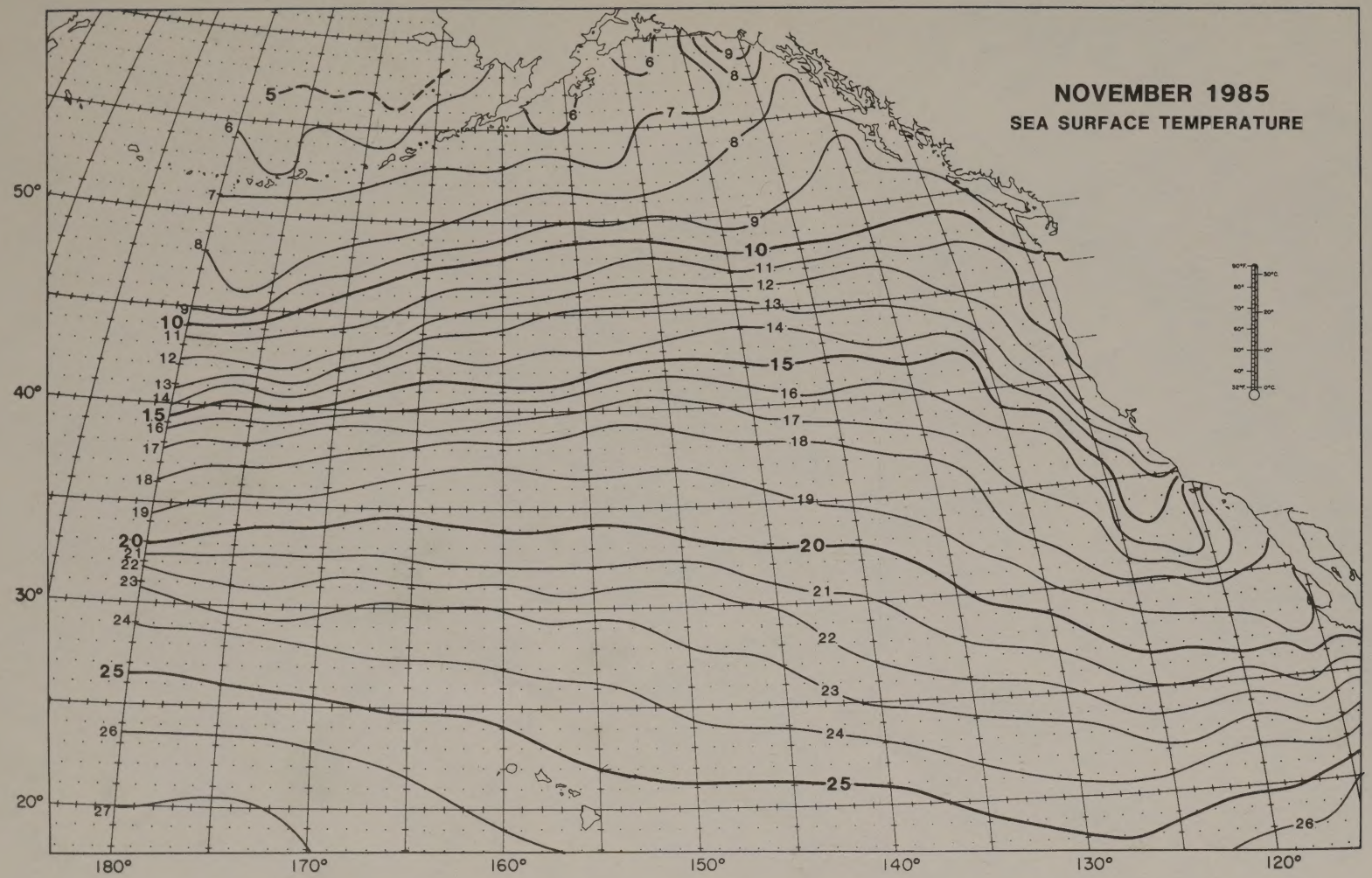

Figure 8h. Average sea-surface temperature (SST) isopleths (^{o}C) by month for the eastern Pacific Ocean, November 1985.